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People's Concerns With the Prediction of COVID-19 in Bangladesh: Application of Autoregressive Integrated Moving Average Model

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Abstract

Introduction: The coronavirus disease 2019 (COVID-19) has become a public health concern, and behavioral adjustments will minimize its spread worldwide by 80%. The main purpose of this research was to examine the factors associated with concerns about COVID-19 and the future direction of the COVID-19 scenario of Bangladesh.

Methods: The binary logistic regression model was performed to assess the impact of COVID-19 concern in Bangladesh. Based on data obtained through online surveys in November 2020 and to predict the next 40 days daily confirmed and deaths of COVID-19 in Bangladesh by applying the Autoregressive Integrated Moving Average (ARIMA) model.

Results: The study enrolled 400 respondents, with 253 (63.2%) were male, and 147 (36.8%) were female. The mean age of respondents was 25.13 ± 5.74 years old. Almost 70% of them were found to be concerned about the COVID-19 pandemic. The result showed that respondents' education level, knowledge regarding COVID-19 transmits, households with aged people, seasonal flu and HD/respiratory problems, and materials used while sneezing/coughing significantly influenced COVID-19 concerns. The analysis predicted that confirmed cases would gradually decrease for the ARIMA model while death cases will be constant for the next 40 days in Bangladesh.

Conclusion: The current study suggested that knowledge about COVID-19 spread and education played a vital role in the decline of COVID-19 concerned. A particular program should focus on creating an awareness of the disadvantages of concerns about the COVID-19 pandemic by augmenting knowledge about COVID-19 spread, enhancing Education in Bangladesh.

Keywords: COVID-19, MERS-CoV, SARS, Quarantine, Education, Health

Introduction

After the emergence of severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome–related coronavirus (MERS-CoV), a new form of coronavirus appeared in December 2019. This coronavirus resulted in an epidemic based in Wuhan, China, causing more than 118 000 cases and 4291 deaths in 114 countries in just three months, which guided the World Health Organization (WHO) on March 11, 2020, to declare it a global pandemic.[1-5] This novel coronavirus originally caused coronavirus disease 2019 (COVID-19), but subsequently, on February 11, 2020, the International Committee on Virus Taxonomy announced this new coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[6-8]

The COVID-19 also spread in more than 213 countries and territories, with 72 471 883 confirmed cases accompanied by 1 616 835 death cases till December 13, 2020[9]. This pandemic led to a major global public health campaign to stop the spread of COVID-19 by taking certain steps, such as washing hands, avoiding touching face, wearing masks in public places, and

maintaining a physical distance.[10] This highly contagious virus conducted a great number of infections, causing an overload of the health care systems and lockdowns in so many countries, disrupting everyday life. [11-14]

The SARS-CoV-2 mortality rate varies significantly. The authentic death toll was expected to be higher than confirmed cases as there were limitations in testing and issues in the attribution of the cause of the death. For reporting death, countries were asked to abide by a standard, that is, "cause of death' classification introduced by the WHO's Classification of Diseases guidelines.[15-18]

As of December 13, 2020, according to the Institute of Epidemiology, Disease Control & Research (IEDCR), there were 490 533 confirmed COVID-19 cases, including a total of 5348 related deaths in Bangladesh, where the case fatality rate was 1.44%.[19] The Ministry of Health and Family Welfare and Directorate General of Health Services (DGHS) divided different areas as red, yellow and green zone based on the prevailing risk of the spreading of COVID-19.[20]

Bangladesh is one of the most densely populated developing country and having extreme inadequacy of testing assays raised concern as this may lead to many undetected cases.[21]

The healthcare systems in numerous countries were pushed to a breaking point. Still, there was no estimation that how long this situation will exist, how many individuals will be infected, and how long normal life will be disrupted. Such unpredictable consequences and uncertainty, and misinformation about the disease influenced people's mental health and caused traumatic stress.[22]

Although the COVID-19 cases are declining in Bangladesh, the rate is not that satisfactory and, the prediction of future movement is crucial. Therefore, based on the online survey, the primary purpose of this study was to explore the current profile of people's concerns about COVID-19 and factors associated with the COVID-19 concern among people in Bangladesh and forecast the future incidence of COVID-19, which was essential. Our study also enlightened some useful recommendations for the authorities to take the necessary strategies to fight and diminish the COVID-19 spread.

Methods
Study Setting
This study is a cross-sectional study and based on both primary data and secondary data. In terms of primary data, data was conducted through an online-based questionnaire survey collected from November 15, 2020, to November 25, 2020. A semi-structured questionnaire was developed in google form to gather relevant information regarding COVID-19. The questionnaire was designed to three sections: consent section, socio-demographic question, and question on the relevant information regarding COVID-19 in the last section. In addition to secondary data, The COVID-19 data from IEDCR was used as secondary data to predict the future scenario of the COVID-19 pandemic.[19] They provided daily data consisting of bar graphs representing confirmed cases, deaths, active cases, and recovered cases. From these data, we included only the confirmed and death cases in our study.

Study Population
After developing the questionnaire, the respondents were adults who use Facebook and understood questions in English. We sent the link through Facebook Messenger only to fill out the form. Therefore, adults who use Facebook and understood questions in English were the study population in this current analysis.

Exclusion and Inclusion Criteria
Respondents under the age of 18 and who did not have any Facebook account were excluded from the survey rather, only respondents aged 18 or older who had a Facebook account were considered for this study.

Participants and Sampling
The data is based on a convenient sampling technique to draw a sample of respondents in this analysis. Based on convenient sampling, a total of 400 respondents aged 18 years or more were considered and answered voluntarily, and the desired information from them was carefully assembled. Therefore, the total sample in this study was 400 adults who were used Facebook in this analysis.

Dependent Variable
People's concern about COVID-19 was assessed as the current dependent variable in this analysis. Here we recode, 1 = Concerned about COVID-19 and 0 = Not concerned about COVID-19.

Independent Variables
In this current research, the employed independent variables were educational status, knowledge about COVID-19 spreading mechanism and symptoms, the infected local/adjacent area, the occurrence of seasonal flu among family members, cleaning hand regularly, having family member over 50 years old, heart disease/respiratory problem in the family, regular outgoing, being free from germs, using masks, covering face while sneezing, and proper knowledge about how vitamin C boosts immunity.

Statistical Methods
Simple descriptive analysis and multivariate statistical analyses were performed in this analysis. Descriptive statistics were used for frequency, and percent of age distributions were analyzed for all variables.

Binary logistic regression was used to assess the effect of an independent variable on concerns about COVID-19 in Bangladesh.

Let Y_i denote the binary dependent variable for the ith observation.

Where, $Y_i = \begin{cases} 1, & \text{if the Respondent is concerned about COVID} - 19 \\ 0, & \text{if the Respondent is not concerned about COVID} - 19 \end{cases}$

$X_{i1}, \ldots, X_{ip}$ is a set of explanatory variables, which can be quantitative or indicator variables referring to the level of categorical variables.

Since Y is a binary variable, it has a Bernoulli distribution

with parameter π_i. The dependence of the probability of success on independent variables was assumed to be respectively as:

$$P(Y_i = 1) = \pi_i = \frac{\exp(\beta_0 + \beta_1 X_{i1} + ... + \beta_p X_{ip})}{1 + \exp(\beta_0 + \beta_1 X_{i1} + ... + \beta_p X_{ip})}$$

The above relation also can be expressed as:

$$g(X) = logit(\pi_i) = log \frac{\pi_i}{1 - \pi_i} = \beta_0 + \beta_1 X_{i1} + ... + \beta_p X_{ip}$$

The likelihood was maximized by finding estimates of the most likely parameters to give us the data. The maximum likelihood estimator of β_0 and β_1 can be obtained by maximizing:

$$L(\beta_0, \beta_1) = \prod_{i=1}^{n} \frac{\exp\{Y_i(\beta_0 + \beta_1 X_i)\}}{1 + \exp(\beta_0 + \beta_1 X_i)}$$

For future prediction, a well-known statistical forecasting model named Autoregressive Integrated Moving Average (ARIMA) model was used, developed by Box.[23]

The SPSS version 25 software (IBM, Corporation, Armonk, NY, USA) was applied for data processing. The R Project for Statistical Computing version 3.6.0 (R Core Team-2019) was used to perform the statistical analyses.

Results

Among 400 respondents, 253 were male, and 147 were female in the study. The mean age of the respondents was 25.13 years, and the standard deviation was 5.74 years. In the present study, Cronbach's alpha was 0.713. In the following sections, the results were shown by analyzing the data of these 400 respondents.

Percentage Distribution of Various Factors

Table 1 illustrates the frequency distribution of socio-demographic factors and health-related general knowledge among Bangladeshi residents. Table 1 shows that the proportion of variables was higher among the respondents who had higher secondary and above education (95%), who knew that the novel coronavirus is transmitted by sneezing and coughing (47.5%) and who could recognize the symptoms of COVID-19 (95%). Moreover, as per Table 1, the respondents whose family members were not infected with seasonal flu (84%), who washed their hands regularly (98.8%), who had no heart disease patients, and elderly members (>50 years old) in their family had a higher proportion of variables. Based on information delivered by the respondents, almost 60% (59.8%) of families refrained from going outside, and 94.8% of participants sanitized themselves after coming from outside. Accordingly, the respondents stick to the practice of using some materials when they feel coughing or sneezing. To be specific, the majority of the respondents (81%) used tissues or handkerchiefs, alongside 16% who covered their mouth with their hand while coughing or sneezing. The table also revealed that more than 80% of the respondents believed that vitamin C helps prevent the novel coronavirus. Also, over 73% (73.8%) were concerned about COVID-19, while 26.3% were not concerned at all.

Percentage Distribution of Multiple Responses

The frequency distribution of respondents and government actions/steps taken for COVID-19 was exhibited in Table 2. Only the two steps taken by the government were not to

Table 1. % Distribution of the People's Socio-Demographic Factors and Health-Related General Knowledge in Bangladesh

Variables	Number	Percent
Educational status		
Secondary education	20	5.0
Higher secondary and above	380	95.0
Knowledge of COVID-19 spread		
Touching infected people/object	100	25
Sneezing/coughing from infected people	190	47.5
Droplets from infected people	56	14
Others	54	13.5
Knowledge about Symptoms		
Yes	380	95
No	20	5
Infected local/adjacent area		
Yes	210	52.5
No	102	25.5
Do not know	88	22.5
Seasonal flu in family		
Yes	64	16.0
No	336	84.0
Clean hand regularly		
Yes	395	98.8
No	5	1.3
50+ aged people in the family		
Yes	305	76.3
No	95	23.8
HD/Respiratory problem in the family		
Yes	156	39
No	244	61
Regular outgoing		
Yes	161	40.3
No	239	59.8
Free from germs		
Yes	379	94.8
No	21	5.3
Use materials when feel cough, sneezing		
The face should be covered with tissue/handkerchief	324	81.0
The face should be covered with hands	64	16.0
Others	12	3.0
Vitamin C is helpful for COVID-19		
Yes	329	82.3
No	71	17.8
Concerned about COVID-19		
Yes	295	73.8
No	105	26.3

Table 2. % Distribution of Respondent and Government Actions/Steps Taken for COVID-19 in Bangladesh

Variables	Number	Percent
The government took steps		
Do not move out of the room without an urgent need	275	68.8
Use masks and gloves when needed	228	57.0
Avoid mass transit and public meetings	45	11.2
Maintain social distances	149	37.2
14-day compulsory home quarantine for people with sneezing cough and non-compliance	29	7.2
Restricting traffic in religious places of worship	45	11.2
Others	158	39.5
Foods taken by the respondents		
Fruits (lemon, orange, grape, grapefruit, tomato, taco fruit)	269	92.7
Vegetables (raw pepper, red pepper, papaya)	82	28.3
Ceevit/another Vitamin C tablet	55	19.0
Others	9	3.1
Family actions are taken for COVID-19		
Making everyone aware of the spreading of the virus	55	13.8
Keeping in mind that everyone is washing hands regularly	159	39.8
Preventing members from going out without any need	181	45.2
Regular cleaning and spraying disinfectants around the home	220	55.0
Others	122	30.5
The respondent took several steps		
Creating social distancing	229	57.2
Washing hands frequently	193	48.2
Self-cleaning and also cleaning the surroundings	117	29.2
Not to touch the nose, face, and eyes with hands	46	11.5
Not to move out of the room without any need	122	30.5
Wearing masks and gloves when leaving the room	122	30.5
Others	150	37.5
Knowledge of COVID-19 symptoms		
Acute fever	346	91.1
Seasonal flu/common cold/dried cough	329	86.6
Respiratory problems	217	57.1
Pneumonia/pneumonia like symptoms	13	3.4
Disability	2	0.5
Sore throat	189	49.7
Others	142	37.4

move out of the house without any urgent need (68.8 %) and to use masks and gloves when needed (57 %) and, these were recorded by more than 50% of the respondents in the sense of preserving social distance (37.2 %). Avoiding mass transits and public meetings were also mentioned by some respondents, along with restricting traffic in religious places. Besides, it was revealed by a large number of respondents that they took fruits (92.7%), vegetables (28.3%), Ceevit/ other vitamin C tablets (19%), and other things (3.1%) as a source of vitamin C. More than half of the respondents mentioned that they embraced regular cleaning and spraying

disinfectants around the home (55%) as family safety actions. Maintaining social distances (57.2%) was taken as personal safety. The respondents' additional family safety actions were preventing members from going out without any need (45.2%) and keeping in mind that everyone is washing hands regularly (39.8%). Moreover, it was also shown from Table 2 and respondents possessed outstanding knowledge of COVID-19 symptoms and, according to them, the symptoms were acute fever (91.1%), seasonal flu/common cold/dried cough (86.6%) and, respiratory problems (57.1%).

Collinearity Diagnostic of Background Variables
Table 3 showed whether or not the independent variables corresponded. Whenever two or more independent variables were correlated in the regression model, multicollinearity occurs, this can be identified using the tolerance and its reciprocal called the variance inflation factor (VIF).[24,25] Multicollinearity can be used to show how much the variance of the coefficient estimate is inflated by the VIF. Usually, typical suggestions for a cutoff point are 5 or 10, as there was no conventional cutoff value or method that prescribes multicollinearity when a VIF was too large.[24] The VIF value of each variable in this study was below 2.

In this instance of tolerance, to determine multicollinearity, no formal cutoff value could be used with tolerance.[26] Manifested by Myers, tolerance value under 0.1 expresses serious collinearity complications, whereas Menard suggested a tolerance value not more than 0.2 exhibits a potential collinearity problem.[27,28] Based on experiments, tolerance, which is 0.1 or less, is a cause of concern.[26] All the variables of the current study with tolerance values were larger than 0.1.

From the above review, this was remarked that multicollinearity was not present in this study.

Multivariate Analysis of COVID-19 Concernedness
The result of the binary logistic regression to show the effect of COVID-19 concernedness on the background variables is shown in Table 4. The Respondent's educational status was one of the determining factors for COVID-19 concerned. As

Table 3. Collinearity diagnostics among the independent variables

Associated Factors	Collinearity Statistics	
	Tolerance	VIF
Educational status	0.933	1.072
Knowledge of COVID-19 spread	0.924	1.082
Knowledge about symptoms	0.906	1.104
Infected local/adjacent area	0.955	1.048
Seasonal flu in family	0.962	1.039
Clean hand regularly	0.946	1.057
50+ aged people in the family	0.838	1.194
HD/Respiratory problem in family	0.885	1.130
Regular outgoing	0.962	1.039
Free from germs	0.953	1.050
Use materials when feel cough, sneezing	0.965	1.036
Vitamin C is helpful for COVID-19	0.953	1.049

Table 4. Binary Logistic Regression for Analysis of People's Concern on COVID-19 and Socio-demographic Factors in Bangladesh

Associated Factors	OR	95 % CI	P Value
Educational status			
Secondary education (ref.)	1		
Higher secondary and above	0.28*	0.09-0.83	0.02
Knowledge of COVID-19 spread			
Touching infected people/object (ref.)	1		
Sneezing/coughing from infected people	0.42**	0.23-0.76	0.004
Droplets from infected people	0.40*	0.17-0.92	0.03
Others	0.38*	0.16-0.84	0.02
Knowledge about symptoms			
Yes (ref.)	1		
No	0.38	0.07-1.40	0.1
Infected local/adjacent area			
Yes (ref.)	1		
No	1.62	0.89-2.96	0.11
Do not know	2.41**	1.32-4.41	0.004
Seasonal flu in family			
Yes (ref.)	1		
No	2.27*	1.09-5.14	0.04
Clean hand regularly			
Yes (ref.)	1		
No	0.37	0.01-7.76	0.60
50+ aged people in the family			
Yes (ref.)	1		
No	0.40**	0.20-0.76	0.006
HD/Respiratory problem in family			
Yes (ref.)	1		
No	2.12**	1.23-3.73	0.008
Regular outgoing			
Yes (ref.)	1		
No	1.24	0.76-2.05	0.39
Free from germs			
Yes (ref.)	1		
No	1.18	0.33-3.60	0.78
Use materials when feel cough, sneezing			
The face should be covered with tissue/handkerchief (ref.)	1		
The face should be covered with hands	1.45	0.74-2.77	0.26
Others	3.94*	1.06-14.51	0.03
Vitamin C is helpful for COVID-19			
Yes (ref.)	1		
No	1.40	0.76-2.54	0.27

Note: significant at **$P<0.01$ and *$P<0.05$, ref. = Reference Category.

the table showed, in this COVID-19 pandemic, 72% (odds ratio [OR] = 0.28, CI: 0.09-0.83, P value = 0.02) of those with higher secondary and higher education levels were less likely to be concerned than those with secondary education levels.

There was also a notable association between COVID-19 and participants who knew how COVID-19 spread (P value

<0.05). Of all participants, those who knew that COVID-19 spreads through sneezing/coughing were 58% OR = 0.42, CI: 0.23-0.76, P value =0.004) less likely to be concerned than who knew that it spreads only by touching infected people/object. Droplets from infected people, with 60% (OR = 0.40, CI: 0.17-0.92, P value = 0.03), were less likely to be concerned than those who knew it spreads only by touching infected people/objects.

Moreover, the present study showed that those unaware of whether there were infected persons in their area/adjacent were 2.4 times (OR =2.41, CI: 1.32-4.41, P value = 0.004) more concerned than the others. Seasonal influenza in family members also showed significant effects in terms of concern about COVID-19 . Surprisingly, our study found that respondents without seasonal influenza in the family were 2.27 times (OR =2.27, CI: 1.09-5.14, P value = 0.04) more likely to be concerned than those who had seasonal influenza. Another impressive finding of our study was that families with elder members over 50 years of age were more concerned compared to their counterparts. Families who did not have heart disease or respiratory problems were 2.12 times (OR =2.12, CI: 1.23-3.73, P value = 0.008) more concerned than those who had these types of health problems.

There was statistical significance with the associated factors of using some materials when coughing, sneezing, and concerned respondents about COVID-19. Respondents who did not use tissues and hands when sneezing or coughing were 3.94 times (OR = 3.94, CI: 1.06-14.51, P value = 0.03) more concerned about COVID-19 than those who used tissues and hands when sneezing or coughing in a public place.

Prediction Analysis of COVID-19
Applied confirmed and death data series to fit two ARIMA

Table 5. Different ARIMA Model for a Confirmed Case

Model	AIC	BIC
ARIMA (2,1,2)	3516.52	3534.08
ARIMA (0,1,0)	3537.02	3540.88
ARIMA (1,1,2)	3514.02	3528.07
*ARIMA (1,1,4)	3500.86	3521.93
ARIMA (1,1,5)	3502.78	3527.37
ARIMA (2,1,3)	3513.50	3534.58
ARIMA (2,1,5)	3501.00	3529.12

* Best ARIMA model

Table 6. Different ARIMA Model for Death Cases

Model	AIC	BIC
ARIMA (2,1,2)	1644.40	1661.97
ARIMA (0,1,0)	1755.75	1759.26
ARIMA (1,1,0)	1677.49	1684.52
*ARIMA (0,1,1)	1640.53	1647.56
ARIMA (1,1,1)	1641.39	1651.94
ARIMA (0,1,2)	1641.45	1651.99
ARIMA (1,1,2)	1642.52	1656.57

* Best ARIMA model.

models to predict the next 40 days for both confirmed and death cases in Bangladesh. Tables 5 and 6 showed the results of the different ARIMA models for the (time series) confirmed and death cases of COVID-19, respectively. The best model was selected based on the principle of Bayesian information criterion (BIC) and Akaike's information criterion (AIC). It was observed that ARIMA (1,1,4) and ARIMA (0,1,1) were in good agreement for the current values of confirmed cases and deaths, respectively.

The ACF correlogram of the residuals (Figure 1) from the ARIMA (1,1,4) model showed that all autocorrelations, except for lags 7 and 14, were within bounds and had no seasonality effect on occurrence. Figure 2 showed that the predicted confirmed cases were gradually decreasing, which was good news for the people of Bangladesh. Figure 3 showed the ACF correlogram of the residuals from the ARIMA (0,1,1) model and demonstrated that except lag 14, all autocorrelations were within the band level. Figure 4 predicted the future death cases from the perspective of Bangladesh, and soon we are going to get a constant death case.

Graphical Illustration of COVID-19

The IEDCR published district-by-district data on the total number of confirmed cases and deaths per day.[19] The geographic map in Figure 5 was created using this accurate data. We created this spatial map using December 13, 2020 (for confirmed cases) and December 6, 2020 (for deaths).

Concerning the confirmed cases, we have divided the whole country into three zones, successively orange, green, and blue. The orange zones denoted the areas with a higher level of infection and were therefore called "risk zone". The map illustrated that Dhaka and Chattogram districts had comparatively higher infection rates (>10 000) and were assigned to an orange zone. Green zones had relatively fewer COVID-19 cases (5001-10 000) than the orange zones. It is also evident from the map that in green zones, Bogura and Sylhet districts had more COVID-19 infection cases than

other districts, indicating that necessary measures should be taken in these zones to prevent the increasing infection rate. The blue zones had slightly fewer confirmed cases.

Figure 5 also showed that most of the COVID-19 deaths occurred in Dhaka Division in terms of deaths. In addition, Figure 6 showed a representation of those affected by the key factors regarding COVID-19 from Bangladesh's perspective. Education, knowledge about the spread of the virus, hand washing, staying at home, the elderly population, and people with heart diseases were considered important factors in this figure. These factors should be given special consideration in future decisions regarding COVID-19.

Discussion

As mentioned earlier, our study aimed to explore the current profile of COVID-19 concerns and predication of COVID-19 among the inhabitants of Bangladesh and give directions to the policymakers about what initiatives should be adopted.

There was a negative association between respondent education and COVID-19 concerns. As per this research, the level of education was a key factor influencing COVID-19 concern, and this particular result was comparable to the
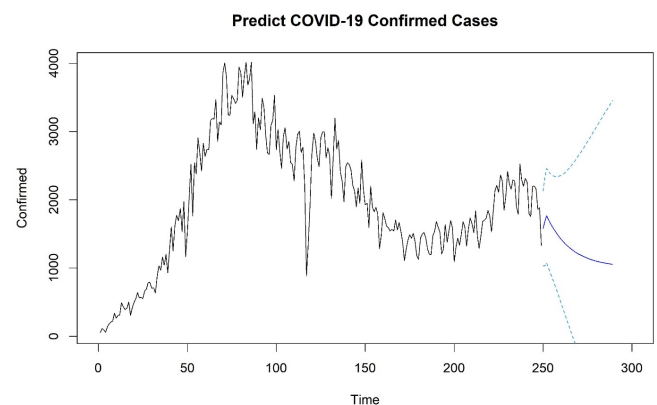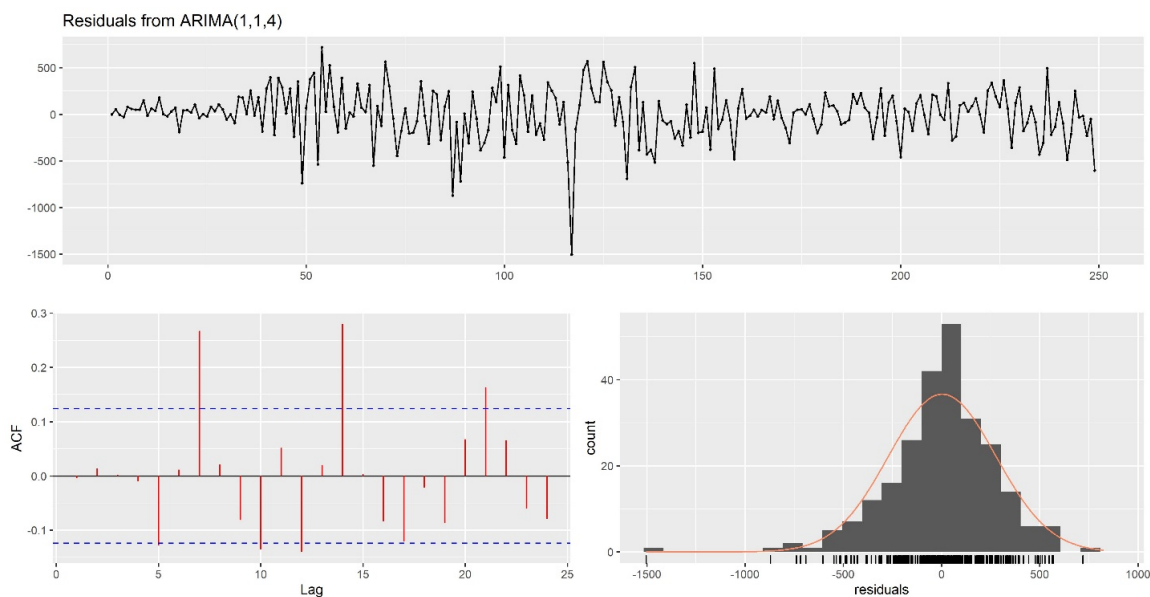

Figure 2. Predict COVID-19 Confirmed Cases.

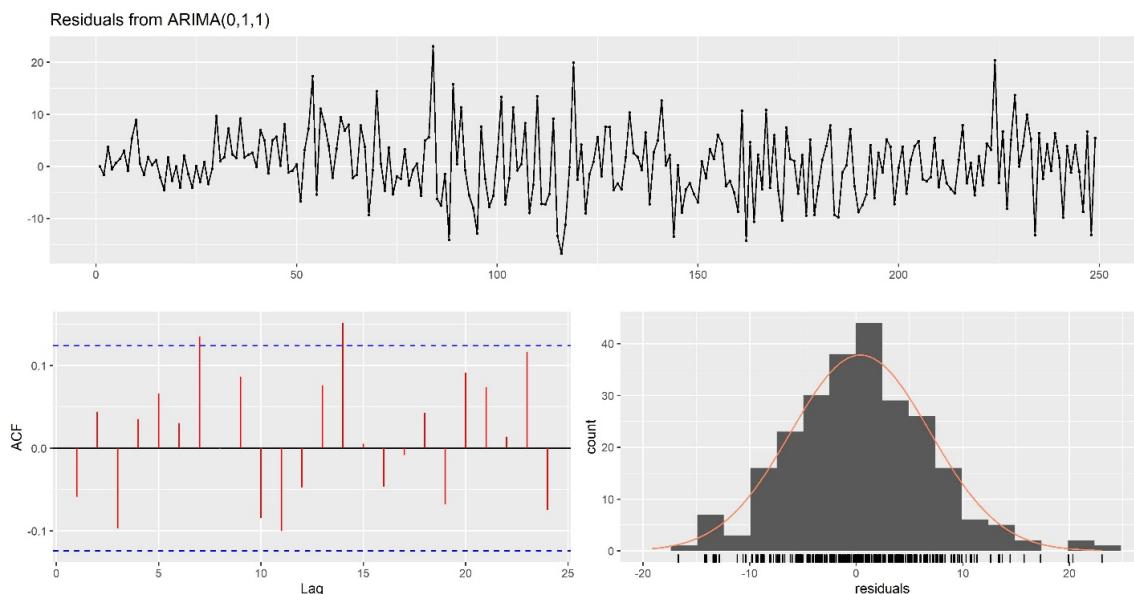**Figure 1.** Residual Plots for ARIMA (1,1,4) Model.

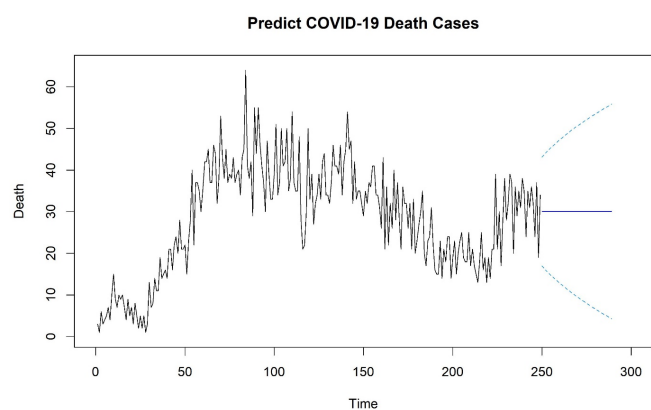**Figure 3.** Residual Plots for ARIMA (0,1,1) Model.

Figure 4. Predict COVID-19 Death Cases.

study carried out in India[29] and Ethiopia.[30] According to them, educational level is a known factor that influences disease awareness. The higher the level of education, the stronger the knowledge about diseases, and vice versa. The present analysis showed that higher secondary or above Education of Respondent had fewer concerns about the COVID-19 pandemic. Some other separate prior studies support this finding.[29,31]

Sneezing/coughing or droplets was significantly associated with COVID-19 concerns and spread. In Bangladesh, participants who were aware that COVID-19 spreads by sneezing/coughing or droplets were less concerned about the virus, although this was not coherent with the results of some other studies.[32,33] Because in a populous country like Bangladesh, most people were poor and going outside the home for their livelihood. For that, people in Bangladesh have engaged in various work, gathering together for earning money in the cluster place. So that is one of the reasons why it was not consistent with previous research.

It was established from the study that respondents were more concerned about the virus in those areas where COVID-19 more occurred. In our analysis, those who were not conscious about whether there were infected people or not in their areas were more than two folds concerned than other individuals. An interesting finding of our analysis showed that those families having members infected with seasonal flu were less likely to be concerned than others. Besides, families with elderly persons over 50 years of age were more concerned, whereas having heart disease/respiratory problems in family members was less concerned about the virus. Also, from this study, individuals who did not go outside were comparatively more worried than others. Few studies demonstrated a direct interaction between going outside and the spreading of the virus responsible for COVID-19.[34] Our study also indicated that 81% of respondents covered their faces when sneezing/ coughing with tissue/handkerchief/hands materials. There was in line with a survey conducted in Ethiopia.[29] Moreover, people who covered their face with tissue/handkerchief/hand during sneezing/coughing to block droplets in a public place were less concerned than others, and this evidence coincides with other separate previous studies.[33,35,36]

If we notice carefully, the COVID-19 cases in Bangladesh seemed to be decreasing day by day. The prediction methods of the ARIMA model suggested the same findings and clearly showed that the number of daily cases in Bangladesh could decrease, and in case of death, it will be constant. However, another study conducted in Bangladesh[37] found a somewhat contrary to our result. We described the results of the Residual plot from the ARIMA model, which showed non-seasonality impact on occurrence and prevalence, a similar conclusion reached by another researcher.[38]

This study showed a few limitations. Firstly, due to the insufficiency of funds, samples could not be collected to represent the whole of Bangladesh. Secondly, due to the sampling frame or list of the target population is not known, we had to consider a convenient sampling technique to draw a sample of respondents in this analysis. Thirdly, it was not feasible to discuss a comparatively great number of points. Fourthly, the cross-sectional nature of the study did not
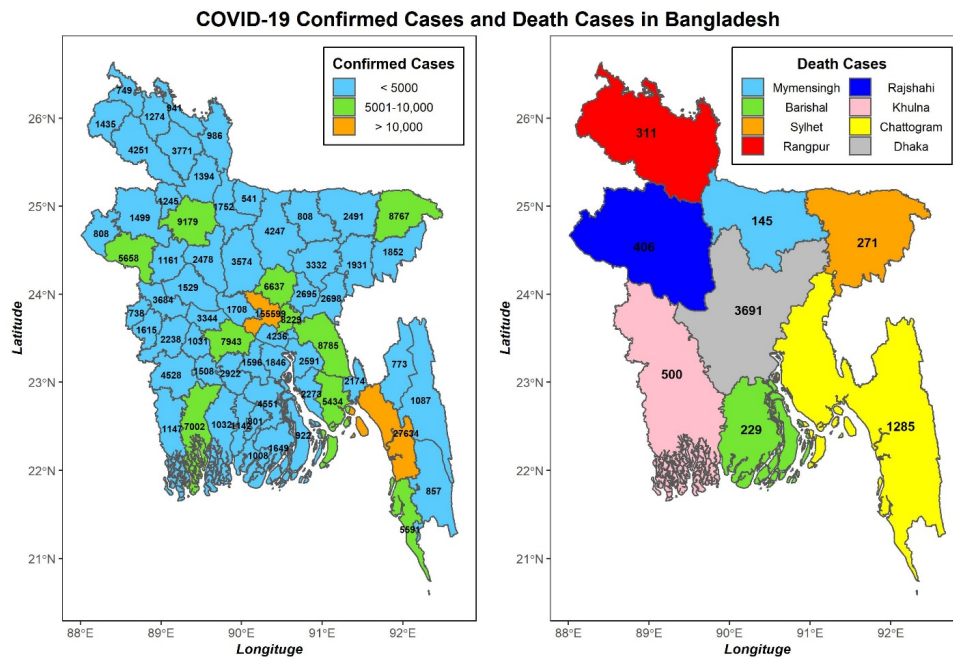
COVID-19 Confirmed Cases and Death Cases in Bangladesh

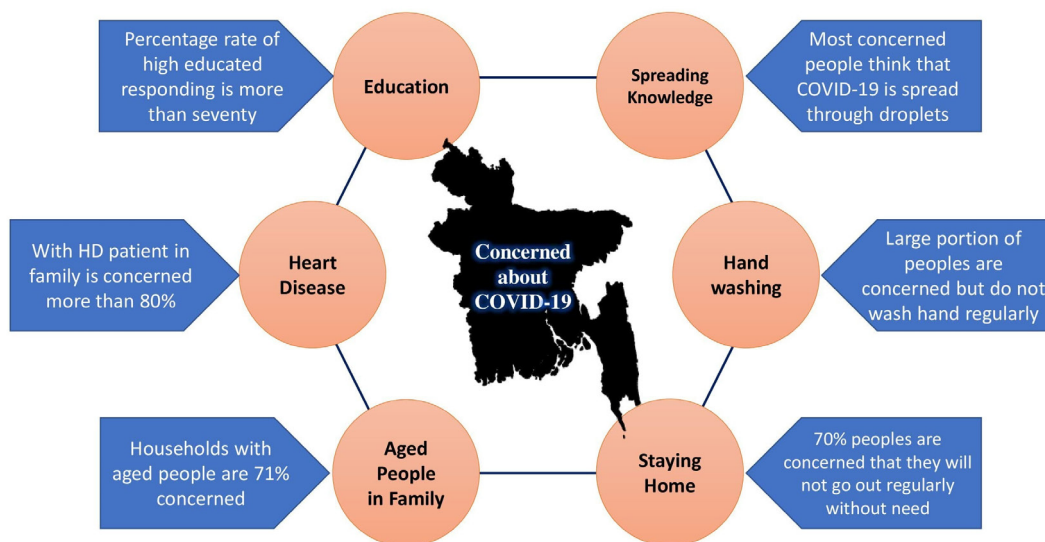**Figure 5.** COVID-19 Situation in Bangladesh (Data source: IEDCR, 2020).

Figure 6. An Illustration of Concerned People With the Key Factors to COVID-19 From the Perspective of Bangladesh.

permit us to exhibit the relationship. Despite having such limitations, the study's objective was to analyze the behavior in massive COVID-19 outbreaks. Hence to throw some light to guide the responsible ones about how to manage pandemic, where necessary initiatives should be taken as well as where it is required to be

Conclusion

In summary, we conclude that educational status, knowledge about COVID-19 spread, infected local/adjacent area, seasonal flu in the family, 50 or more aged people in the family, HD/Respiratory problem in the family, use materials when feeling cough, sneezing were the most significant findings. In terms of the ARIMA predictive model, we revealed that confirmed cases gradually decreased in Bangladesh while

death cases will be constant in Bangladesh. The World Health Organization (WHO) recommended wearing a mask, washing hands by handwash/hand sanitizer/soap for 20 minutes, and maintaining a social distance by lockdown was a way to prevent coronavirus and directly related to people's attitudes and their concern. In conformity with the study, it was evident that the COVID-19 situation in Bangladesh was very delicate. The Respondent's educational status was one of the determining factors for reduce COVID-19 concerns. Therefore, the awareness of respondents should be uplifted immediately. For this reason, to get rid of this predicament, the government should take different steps to reduce the COVID-19 spread. Concern by ensuring people awareness, knowledge, and unconcerned of this pandemic again execute the law for people to remove all types of gathering, mandatory

Research Highlights

What Is Already Known?

The study revealed several factors associated with COVID-19 concerns among people in Bangladesh. Those family had fifty or more aged people were more concerned about COVID-19 pandemic in Bangladesh. In contrast, high education status is associated with lower levels of concern about COVID-19 among Bangladeshi people.

What Does This Study Add?

The present study identified people concerned about COVID-19 and the prediction of COVID-19 in the next 40 days in Bangladesh. In Bangladesh, participants aware that COVID-19 spreads by sneezing/coughing or droplets were less concerned about the virus. Those families' members who had heart disease or respiratory problems and seasonal flu were less concerned than members with no heart disease or respiratory problems. We believe that this study will be of significant interest for the policymaker to assess the current profile of COVID-19 and the future scenario of COVID-19 direction in Bangladesh.

wearing mask outside the home, and create a campaign about social distance about this pandemic.

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