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Statistical view of coronavirus (COVID-19) in Bangladesh

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Abstract

This paper observes the statistical estimation of coronavirus and its awareness in Bangladesh. Since coronavirus disease (COVID-2019) is burning question in the world and more than 20 Lac peoples are affected by this virus. There is no medicine and vaccination to prevent against this virus. So I am trying to show the present and future view of such virus in contest of Bangladesh. I have considered daily data (8 March to 15 April, 2020) of total number of cases and total number of death. It has been found total number of cases and total number of death increase and cumulative total number of cases and total number of death radically changed over the period. I have used non linear trend of exponential growth model to estimate the cumulative total cases and total death and predict the future estimation of affected people in Bangladesh. Also found there is positive correlation between number of cases and number of death and they are statistically significant and finally used exponential smoothing approach. It will be reach cumulative total of cases 12828477 and cumulative total of death 174903 respectively after two months. So it's important alarming to prevent COVID-19 for the Bangladesh in next two months.

Keywords: Statistics, COVID-2019, cumulative total case, cumulative total death

Introduction

On 31st December 2019, 27 cases of pneumonia of unknown disease were identified in Wuhan City, Hubei province in China ^[1]. The causative agent was identified from throat swab samples conducted by the Chinese Centre for Disease Control and Prevention (CCDC) on 7th January 2020, and was subsequently named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) ^[2]. The Chinese public health, clinical, and scientific communities took prompt response to allow for timely recognition of the new virus and shared the viral gene sequence to the world ^[4, 5]. After that, in China about 82160 people were affected till now by this coronavirus disease. Chinese authorities initially reported that most patients in the Wuhan outbreak were epidemiologically linked to a large seafood and animal market ^[9].

The World Health Organization (WHO) has recently declared coronavirus disease 2019 (COVID-19) a public health emergency of international concern ^[2]. On January 30, 2020, the World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern (PHEIC) ^[6]. On February 12, 2020, WHO named the disease caused by the novel coronavirus as Coronavirus Disease 2019 (COVID-19) ^[7, 8]. Now more than 200 countries already affected by COVID-19 and infection have been reported in USA, UK, Thailand, Japan, Korea, Italy, Spain, France, India, Singapore, Malaysia, Bangladesh and so on. As of April 13, 2020, a total of 1853619 laboratory-confirmed cases had been documented globally ^[12]. Number of death also radically increased day by day in the world. In recent studies, the severity of some cases of Covid-19 mimicked that of SARSCoV. Given the rapid spread of Covid-19, we determined that an updated analysis of cases throughout mainland China might help identify the defining clinical characteristics and severity of the disease ^[3].

Bangladesh is a small in geographically and the most populous density country in the world. On 7 March, the first coronavirus case was detected after the tests were positive for COVID-19 in Bangladesh and was declared on the next day through a press conference. On 8 March, IEDCR director announced at a press conference in Dhaka that 2 men and 1 woman had tested positive for the coronavirus. The patients were aged between 20 and 35. Of them, two men were Italy returnees and the woman was a family member of one patient and got infected by

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coming in contact with him. From the first day of coronavirus detected in Bangladesh, its increase number of cases and number of death day by day. The government has lockdown all the sectors including educational sector as well. As the report of IEDCR, Bangladesh, 621 people were affected by COVID-19 and total number of death 34 on 13 April, 2020. So that, it's very alarming that what will be and how can be tackle the critical situation by the government of Bangladesh. The study has shown present situation of the disease and how can it grow up in future.

Objectives

- I. To know the present status of novel coronavirus in Bangladesh.
- II. To show the affect of social life of the people of Bangladesh and planning as well.
- III. To forecast the cumulative total cases and death of Bangladesh by COVID 2019 for the next two months.

Data and Method

This study has been made some daily basis data (8 March to 15 April, 2020), collected from different website (World health organization, Health ministry of Bangladesh, IEDCR ^[11] etc) and total number of cases collected from IEDCR daily report. Considering two variables for the analysis such as total cases and total death further consider into cumulative total cases (CTC), cumulative total death (CTD).

Non linear exponential or logarithmic method

In many situations, linear trends may not be found in time series data, instead, the nature of trend may be curvilinear. In that case, straight line cannot express the data of cumulative total cases and total death. This type of pattern of trends can be better expressed by non linear method ^[12].

$$y = ab^x$$

$$\log y = \log a + x \log b$$

Where, y = Dependent variable

x = Independent variable (time)

a = Constant and b= Change of slop

Exponential Smoothing Method

One can develop a better forecast using a given time series data, if it is possible to determine which components actually exist in the series. If the randomness is present in the data, it is required to smooth out the data to remove randomness. One of the simplest ways of removing the random or irregular fluctuation is to smooth the time series ^[12].

$$F_t = \alpha y_{t-1} + (1-\alpha) F_{t-1}$$

Where, F_t = current period forecast

F_{t-1} = last or previous period forecast

α = a weight called smoothing constant, $0 \leq \alpha \leq 1$

y_{t-1} = last period observed value of the variable, $F_1 = y_1$

It has been used non linear exponential growth method to estimate the cumulative total cases and total death and predict the future estimation of affected people in Bangladesh and Chi-square test for checking significance of the variables. Finally, it was used exponential smoothing approach for forecasting to the next two months. Absolute changes of such virus during this period and what will be changed in future were estimated using MS excel and SPSS software 15.0 version. Various statistical tools such as descriptive analysis and non linear trend of exponential growth method were used to analysis the data.

Result and Discussion

Frequency distribution of total number of cases and total number of death by March, April-2020

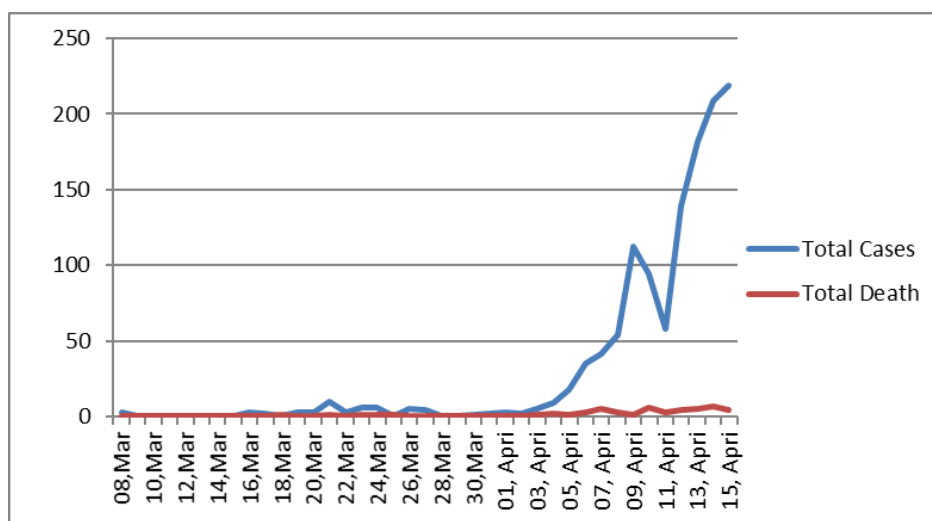


Fig 1: Line diagram of total number of cases and total number of death by March, April-2020

It indicates that cases started by 08 March, 2020 with 3 people attack with Coronavirus in Bangladesh and from April increase rapidly and total death also increase slowly.

Cumulative frequency distribution of total number of cases and total number of death by March- April-2020:

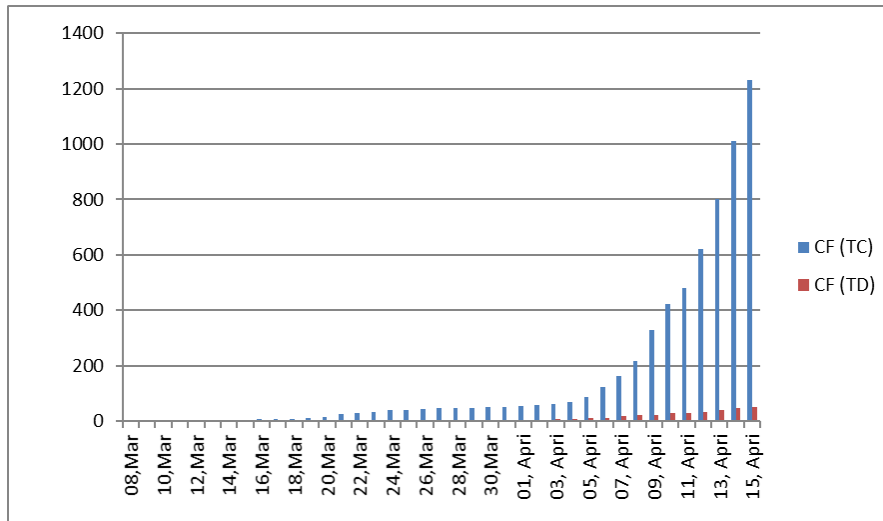


Fig 2: Bar diagram of cumulative total number of cases and cumulative total number of death by March-April-2020.

It indicates that cumulative number of cases has been changed and rapidly rises over the period and total number of death also proportionally increasing day by day.

Non linear time series analysis of cumulative frequency of total number of cases and total number of death:

Table 1: Non linear exponential growth method of cumulative total cases:

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.288	.048		6.025	.000
	time1	.067	.002	.982	31.435	.000

a. Dependent Variable: L.Y

Comment: Cumulative frequency of total number of cases significantly depends on the time period.

Table 2: Non linear exponential growth method of cumulative total deaths:

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.065	.044		1.475	.152
	time1	.057	.003	.971	21.001	.000

a. Dependent Variable: L.Y.D

Comment: Cumulative frequency of total number of death significantly depends on the time period.

Table 3: Correlation between of total number of cases and total number of death:

Symmetric Measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig. ^c
Interval by Interval	Pearson's R	.811	.066	8.424	.000 ^c
Ordinal by Ordinal	Spearman Correlation	.775	.082	7.465	.000 ^c
N of Valid Cases		39			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

There is strong positive correlation between of total number of cases and total number of death ($r = 0.81$).

Table 4: Chi-square test between total number of cases and total number of death:

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	244.119 ^a	133	.000
Likelihood Ratio	100.725	133	.983
Linear-by-Linear Association	24.977	1	.000
N of Valid Cases	39		

Comment: Since null hypothesis is rejected, so we may there is an association between of total number of cases and total number of death.

Exponential Smoothing:

Table 5: Exponential Smoothing model table of total number of cases, total number of death, cumulative total number of cases and cumulative total number of deaths:

Model Statistics						
Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
T.cases-Model_1	0	-.089	9.561	17	.921	0
T.death-Model_2	0	.320	37.873	17	.003	0
CF.TC-Model_3	0	-.293	74.769	17	.000	0
CF.TD-Model_4	0	-.444	71.869	17	.000	0

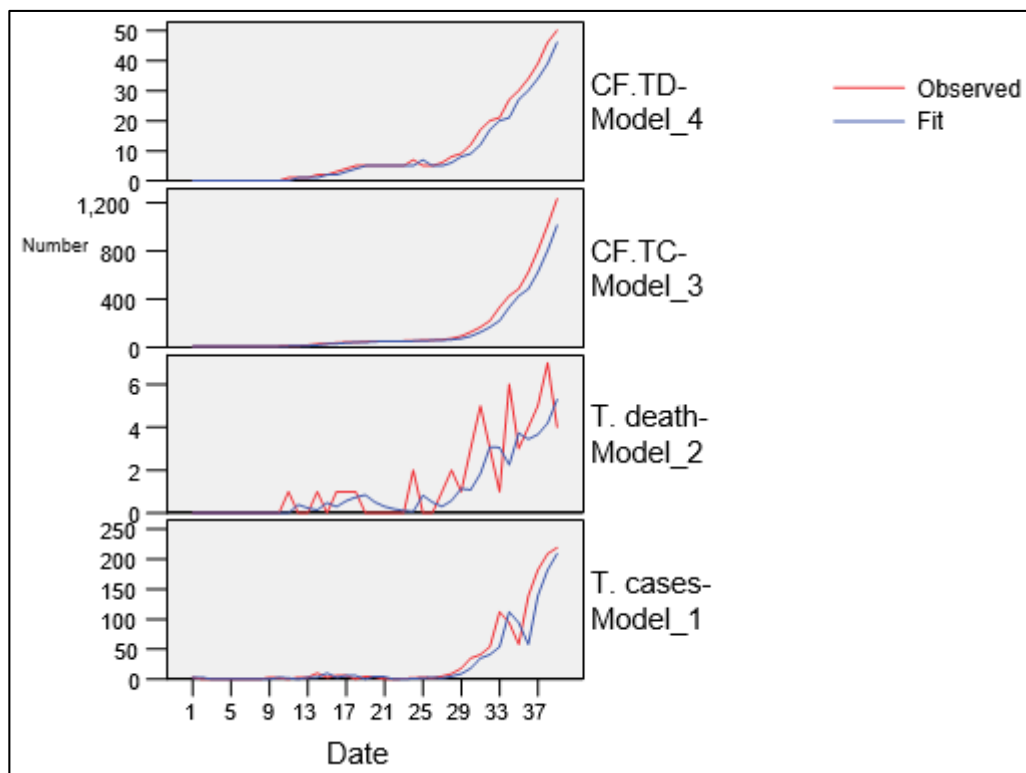


Fig 3: Compare of observe and fitted value of total cases, total death, cumulative total cases and cumulative total death by Exponential Smoothing model.

Forecast value of cumulative frequency of total number of cases and total number of death for the next two months in Bangladesh:

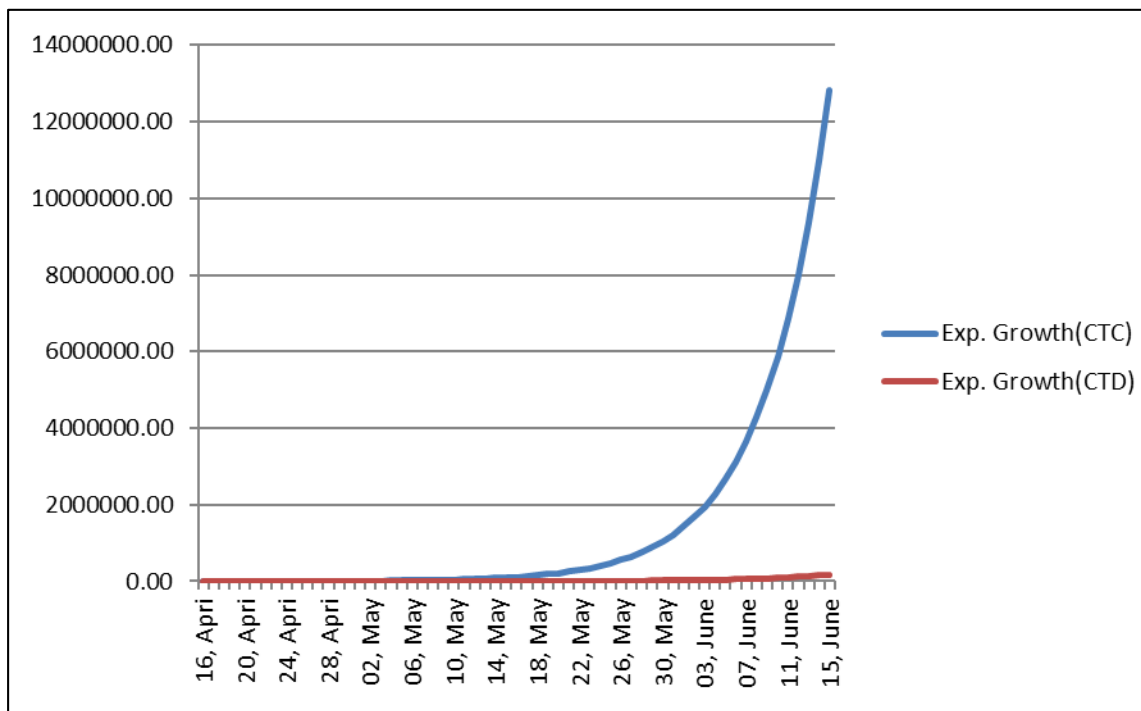


Fig 4: Forecasting of cumulative total cases and death for the next two months in Bangladesh

Conclusion

At the moment, COVID-19 related variable are very important to study for any country. As a developing country, current study is indispensable for Bangladesh to fight against COVID-19. Since it will be get to cumulative total cases 12828477 and cumulative total death 174903 for the next two months. This study has been shown what will be the impact of such virus in social life of people and how can make a policy to tackle the critical time. So it's important to study the present and future scenario of COVID-19 in Bangladesh for the next generation.

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