Section: Miscellaneous

Original Article

ISSN (O): 2347-3398; ISSN (P): 2277-7253

Predictors Associated with COVID-19 deaths in Ethiopia

Yenew Alemu Mihret

Lecturer, Department of Statistics, Injibara University, Injibara, Ethiopia, East Africa.

Abstract

Background: Coronavirus disease is an infectious disease that causes a newly discovered coronavirus. Ethiopia is one of the most impacted countries relative to the proportion of COVID-19 case growth and infection. The purpose of this investigation was to identify the determinants of COVID-19 disease in Ethiopia. **Subjects & Methods:** The source of the data for this study was the 2020 Ethiopia health ministry from March up to July using multiple linear regression models. **Results:** Among 468,814 total tests, 9,027 recovered, 20,900 confirmed cases, and 365 deaths from Coronavirus diseases in Ethiopia. Critical cases (β= 0.570, p= 0.006) and average temperature (β= -35.061, p= 0.003) variables were statistically significant. **Conclusion :** Critical or serious cases significantly and positively affect the deaths of this pandemic disease, while average temperature significantly and negatively affects the deaths of COVID-19 diseases in Ethiopia.

Keywords: COVID-19, Predictors, Multiple linear regression, Ethiopia

Corresponding Author: Yenew Alemu Mihret, Lecturer, Department of Statistics, Injibara University, Injibara, Ethiopia, East Africa.
E-mail: yenewalemu@gmail.com

Received: 21 July 2020 **Revised: 23 August 2020** **Accepted: 01 September 2020** **Published: 06 October 2020**

Introduction

Corona Virus disease (COVID-19) is a disaster, speedily dispersion, and affected death worldwide. It is a breathing infection that can extent from individual to the individual causing virus-like indicators and in severe cases death. It was first reported in China and the World Health Organization affirmed the occurrence of an epidemic but it has now spread throughout the universe. [1,2]

COVID-19 impurity is rumored to an extent through breathing dewdrops, contact with bodily fluids, and with contaminated surfaces. [3] COVID-19 epidemic spreads from individual to individual from through infected air precipitations, people contact with fingers or faces that contain the virus and touch their eyes, nose, or mouth with the unclean hands.

Africa recorded 23,209 Corona Virus deaths and the confirmed cases also rise to 1,045,234 (Africa CDC, 10 August 2020). Ethiopia is currently one of the most impacted nations relative to the proportion of COVID-19 case development and contagion. A state of emergency lasting five-months has been imposed by the Prime Minister of government. All land borders have since been shut as a virus control measure with a number of restrictions and implementation of physical distancing and mask-wearing measures. But the pandemic is rising due to temperature change (summer season) and ignoring the ministry of health rules about controlling the COVID-19 pandemic. Ethiopia recorded 407 Corona Virus Deaths since the epidemic began, according to Ethiopia ministry of health (9 August 2020). In addition, Ethiopia reported 22,818 Corona Virus Cases.

The main restriction to speechless the matter is the deficiency of potential injections to treat or control the disease. The aim of this investigation was to assess the risk factors of COVID-19 disease in Ethiopia using multiple linear regression models.

Subjects and Methods

Source of the Data

The source of the data for this study was the 2020 Ethiopia health ministry from March up to July.

Variables in the study

The response variable for this study is the number of deaths on COVID-19 per month. The predictor variables are the number of new confirmed cases, recovered, critical, total tests, and average temperature.

Methods of data analysis

Multiple linear regression model is a regression model with one response or regressed variable and two or more than two explanatory or predictor variable. The general form of multiple linear regression models is as follows:

$Y= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_p x_p + \varepsilon$,

Where, Y is response variable, X_1, X_2, …, X_p are the explanatory variables, p is the number of explanatory variable and ε is the stochastic disturbance term.

Model assumptions

The technique of least squares can be used to estimate the regression coefficients. Analysis of variance (ANOVA) is the technique of decomposing the total sum of squares into its components. i.e., the technique decomposes the total variation in the dependent variable into the explained and unexplained variations. A test of model adequacy is accomplished by testing the null hypothesis:

H_0: $\beta 1 = \beta 2 = \ldots\ldots = \beta p = 0$

H_A: H_0 is not true

The test statistic is given by:

$$F_{cal} = \frac{\frac{RSS}{P}}{\frac{ESS}{n-P-1}}$$

Where, n is the sample size, RSS is regression sum square and ESS is error sum of square. We say that the linear model is adequate in explaining the relationship between the response variable and one or more of the predictor variables if:

$F_{cal} > F_{\alpha}$ (P, n-P-1)

Tests on the regression coefficients

To test whether each of the coefficients is significant or not, the null and alternative hypotheses are given by:

H_0: $\beta_j = 0$

H_A: $\beta_j \neq 0$ for j=1,2,….,p.

The test statistic is:

$$t_j = \frac{\widehat{\beta}_j}{s.e.(\widehat{\beta}_j)}$$

Decision rule

If $| t_j | > t_{\alpha/2}$ (n-pi1), we reject H_0 and conclude that β_j is significant, that is, the regressor variable X_j, j = 1,2,….,p, significantly affects the dependent variable Y.

Results

As shown in [Table 1], among 468,814 total tests, 9,027 recovered, 20,900 confirmed cases, and 365 deaths from Coronavirus diseases in Ethiopia.

By using the backward selection method; Temperature, total tests, and critical or serious cases were the most important variables.

Based on [Table 2], p-value (0.002) < 0.05 (5% level of significance). Thus, the linear regression model is adequate.

Table 1: Descriptive statistics of COVID-19 in Ethiopia from March – July.

Confirmed	Recovered	Number of Death	Total test
20,900	9,027	365	468,814

As shown below in [Table 3], Critical cases and average temperature per month significantly affect the number of deaths at the 5% level of significance. Critical or serious cases significantly and positively affect the number of deaths per month, while average temperature significantly and negatively affects the number of deaths in COVID-19. The estimated coefficient of the critical cases is 0.570. Holding average temperature and total tests constant, a one-person increase in critical cases results in a 0.57 units increase in the number of deaths. The estimated value of deaths decreases by 35.1 units for each increase of 1 degree Celsius of average temperature, holding critical cases, and total tests constant.

Discussion

The principal purpose of this research was to identify the risk factors of COVID-19 in Ethiopia based on the 2020 Ministry of health data. As the results revealed, average temperature per month was found to be an important predictor for the deaths of COVID-19 in Ethiopia. Based on the data, if we went from dry season to summer season, it increased the Covid-19 deaths. That means the average temperature in June and July was cold (low) as compared to other months and occurred high death rates in the summer season. Researchers revealed that the low average temperature was safe (not harmful) to the virus.[4–9]

According to the results, the critical case was a significant determinant of COVID-19 deaths. Anyone who has entered the serious cases was old age and living other infected diseases such as hypertension, HIV aids, sugar diseases, people who have breathing problems, and so on. The finding of this study indicated that as the number of critical cases increases the number of passing away in the COVID-19 virus also rises. A high critical case was elevated the COVID-19 deaths. This result is consistent with the findings by.[10–12]

Conclusion

The vital of this investigation was to assess the factors of COVID-19 deaths. The study was based on secondary data obtained from the ministry of health (Ethiopia). The current study indicated that critical cases and the average temperature were the risk factors that influence COVID-19 deaths in Ethiopia. In order to minimize the death of COVID, We should be able to clean your hand regularly with soap and water, wearing mouth-mask, following instructions from public and

Table 2: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42565.933	3	14188.644	212217.702	.002
	Residual	.067	1	.067		
	Total	42566.000	4			

Table 3: Coefficients

Model	Unstandardized Coefficients		t	Sig.	95% Confidence Interval for B	
	B	Std. Error			Lower Bound	Upper Bound
(Constant)	877.143	4.710	186.225	.003	817.295	936.991
Critical cases	.570	.005	115.634	.006	.507	.632
Total tests	3.650E-5	.000	10.518	.060	.000	.000
The average temperature in ^{O}C	-35.061	.187	-187.638	.003	-37.435	-32.687

global health institutions especially keep the social distance from critical cases, and stay at home mainly in the summer season.

Limitations

The data used in this study was from the March – July 2020 ministry of health, Ethiopia. Thus, the results may not necessarily reflect the current situation of August 2020.

References

1. Chang MC, Seo WS, Park D, Hur J. Analysis of SARS-CoV-2 Screening Clinic (Including Drive-through System) Data at a Single University Hospital in South Korea from 27 January 2020 to 31 March 2020 During the COVID-19 Outbreak. Healthcare (Basel). 2020;8(2):145–145. Available from: https://dx.doi.org/10.3390/healthcare8020145.
2. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Napoli RD. Evaluation, and Treatment of Coronavirus (COVID-19). StatPearls [Internet]. 2020;.
3. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. N Engl J Med. 2020;382(13):1199–1207. Available from: https://doi.org/10.1056/nejmoa2001316.
4. Bi P, Wang J, Hiller JE. Weather: driving force behind the transmission of severe acute respiratory syndrome in China? Intern Med J. 2007;37(8):550–554. Available from: https://dx.doi.org/10.1111/j.1445-5994.2007.01358.x.
5. Casanova LM, Jeon S, Rutala WA, Weber DJ, Sobsey MD. Effects of Air Temperature and Relative Humidity on Coronavirus Survival on Surfaces. Appl Environ Microbiol. 2010;76(9):2712–2717. Available from: https://dx.doi.org/10.1128/aem.02291-09.
6. Chan KH, Peiris JSM, Lam SY, Poon LLM, Yuen KY, Seto WH. The Effects of Temperature and Relative Humidity on the Viability of the SARS Coronavirus. Adv Virol. 2011;2011:1–7. Available from: https://dx.doi.org/10.1155/2011/734690.
7. van Doremalen N, Bushmaker T, Munster V. Stability of Middle East respiratory syndrome coronavirus (MERS-CoV) under different environmental conditions. Euro Surveill. 2013;18(38):20590–20590. Available from: https://dx.doi.org/10.2807/1560-7917.es2013.18.38.20590.
8. Prata DN, Rodrigues W, Bermejo PH. Temperature significantly changes COVID-19 transmission in (sub)tropical cities of Brazil. Sci Total Environ. 2020;729:138862. Available from: https://dx.doi.org/10.1016/j.scitotenv.2020.138862.
9. Bannister-Tyrrell M, Meyer A, Faverjon C, Cameron A. Preliminary evidence that higher temperatures are associated with a lower incidence of COVID-19, for cases reported globally up to 29th. Front Public Health. 2020;8:367. Available from: https://dx.doi.org/10.3389/fpubh.2020.00367.
10. Liang LL, Tseng CH, Ho HJ, Wu CY. Covid-19 mortality is negatively associated with test number and government effectiveness. Sci Rep. 2020;10(1):12567. Available from: https://dx.doi.org/10.1038/s41598-020-68862-x.
11. Chaudhry R, Dranitsaris G, Mubashir T, Bartoszko J, Riazi S. A country level analysis measuring the impact of government actions, country preparedness and socioeconomic factors on COVID-19 mortality and related health outcomes. EClinicalMedicine. 2020;25:100464. Available from: https://dx.doi.org/10.1016/j.eclinm.2020.100464.
12. Singhal T. Clinical characteristics of 82 cases of death from COVID-19. Indian J Pediatr . 2020;87(4):281–286. Available from: https://dx.doi.org/10.1007/s12098-020-03263-6.

How to cite this article: Mihret YA. Predictors Associated with COVID-19 deaths in Ethiopia. Asian J. Med. Res. 2020;9(3):1-4.

DOI: dx.doi.org/10.47009/ajmr.2020.9.3.MC1

Source of Support: Nil, **Conflict of Interest:** None declared.