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Lockdown Effect on COVID-19 Incidence and Death: Iran Experience

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Brief Report

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Abstract

Objective: Countries are trying several policy options for decreasing the incidence and burden of the coronavirus disease 2019 (COVID-19). One of these strategies is a lockdown, complete closure, to reduce the risk of distributing disease by means of social interactions. This study aimed to analyze the effect of a 3-week lockdown on the mortality and morbidity of COVID-19 in Iran.

Methods: Official daily data on COVID-19 incidence and death reported by the World Health Organization (WHO) were extracted from September 1, 2020, to January 14, 2021. Data were analyzed using interrupted time series analysis by means of STATA 14 software.

Results: Lockdown resulted in a significant reduction in the daily death from COVID-19 in the short-term ($\beta = -139$; $P < 0.01$) and in the long-term ($\beta = -12$; $P < 0.01$). Moreover, lockdown in the short-term insignificantly ($\beta = -21.58$; $P = 0.969$), and in the long-term significantly ($\beta = -317.31$; $P < 0.01$) reduced the COVID-19 daily incidence.

Conclusions: The results showed that the lockdown has a significant effect on incidence and death numbers. Therefore, it could be a suitable short-term strategy for controlling the COVID-19 outbreak. On the other hand, its negative effects on households and businesses should be considered.

Coronavirus disease 2019 (COVID-19) pandemic has become a major global health problem in recent years. It changes lifestyles and working life. It also resulted in changing the economic situations of individuals and companies.[1,2] Therefore, governments are trying to change the situation and do all their best to defeat COVID-19.

Health systems and governments are planning and initiating different actions in battle with the COVID-19 epidemic.[2] Using personal protection equipment, handwashing, and social distancing are the core strategies in nearly all health systems.[3,4] Because the prevalence of the disease in any given area changes over time, some governments impose restrictions on population movement and restrict unnecessary trips.[5]

In Iran, the first case of COVID-19 infection was officially reported on February 19, 2020. From then to January 14, 2021, nearly 1,311,810 people were infected and 56,538 died. Iran has experienced 3 waves of the COVID-19 outbreak. The third wave started around the beginning of October 2020. The highest reported number of daily cases was 14,051, reported on November 27, 2020.[6]

Iran has tried several policy options to decrease COVID-19 prevalence from the beginning of the outbreak. After increasing the trend of death and incidence of the COVID-19 cases in the third wave, Iran initiated a 2-week lockdown as the main peak happened. It extends for 1 more week in some provinces, which was from November 21 to December 11, 2020. In this lockdown, most governmental and private organizations, shopping centers, and stores that do not provide essential products were closed. In addition, all mass gatherings were canceled or held in an online format. This widespread lockdown was the most long-lasting and rigid lockdown since the beginning of COVID-19 emergence in Iran.

Many countries use the lockdown intervention for controlling the spread of COVID-19. Therefore, this report aimed to analyze the effect of a 3-week lockdown strategy on the incidence and death numbers of the COVID-19 in Iran. The results could help policy-makers with their future actions toward controlling the COVID-19 outbreak.

Methods

In this time series analysis, we used Iran's official statistics on COVID-19 incidence and death from September 1, 2020 to January 14, 2021. The beginning of the period was between the second and third waves of the outbreak in Iran. The end of the period was selected based on the last data (January 14, 2021). Therefore, the time span covers around 120 time points (70 day before and 50 day after the intervention). We considered 1 week after lockdown as

Table 1. Interrupted time series analysis of lockdown effects on the COVID-19 daily death and incidence in Iran

		Daily incidence (number of new cases in a day)	Daily death (number of deaths in a day)
Pre-lockdown	Initial level[a]	−33.16 (0.898)	74.07 (0.000)
	Initial trend[b]	143.28 (0.000)	4.99 (0.000)
Post-lockdown	Change in level after lockdown (short-term)[c]	−21.58 (0.969)	−139.13 (0.000)
	Change in trend after lockdown (long-term)[d]	−317.31 (0.000)	−12.00 (0.000)
	Trend after lockdown[e]	−174.03 (0.000)	−7 (0.000)
Model significance	F-statistics	280.72 0.000	871.68 (0.000)

[a]Constant term (y-intercept) of regression line before lockdown.
[b]Slope of regression line before lockdown.
[c]Changes in constant term of regression line after lockdown rather than before lockdown.
[d]Changes in slope of regression line after lockdown rather than before lockdown.
[e]Slope of regression line after lockdown.

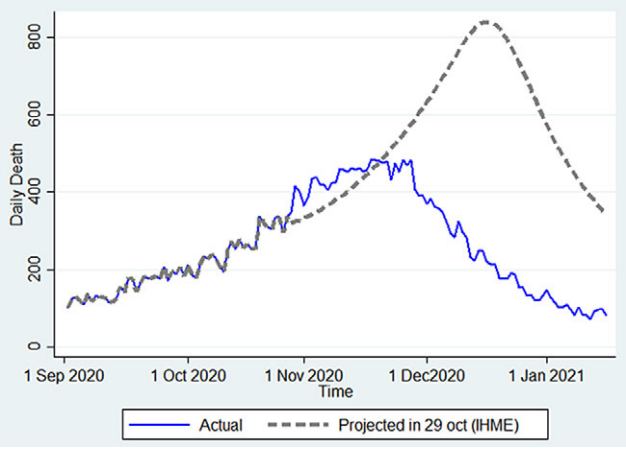

Figure 1. The actual and IHME projected trend of daily death from September 1, 2020, to January 14, 2021.

the initial effect of the intervention in the model. This is determined according to the change in behavior of incidence and death data. The lockdown was started on November 21, 2020. Daily incidence and death data were extracted from the Iran Ministry of Health and Medical Education reports published on the World Health Organization (WHO) website.[6] We also compare the actual trend with the projected trends of the Institute for Health Metrics and Evaluation at (IHME) on October 29, 2020, before the intervention.[7,8] Data were analyzed using interrupted time series analysis using STATA 14 software (4905 Lakeway Drive, College Station, Texas, USA). The study protocol was approved by the Ethics Committee of Shiraz University of Medical Sciences with code IR.SUMS.REC.1399.1245.

Results

According to the previous projections by IHME, on October 29, 2020, death from COVID-19 increased and reached more than

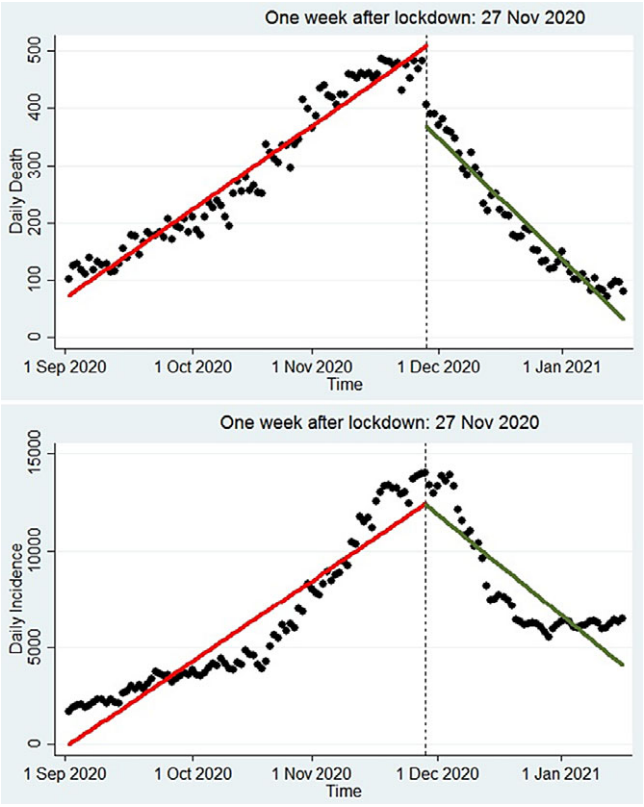

Figure 2. The trend of COVID-19 daily cases and death from September 1, 2020, to January 14, 2021 (before and 50 day after the lockdown).

800 cases per day. However, the actual trend showed that lockdown has noticeably changed the previously projected trend (Figure 1).

Findings from interrupted time series analysis (Table 1) indicate that although the immediate (after 1 week) decrease in daily incidence after lockdown is insignificant ($\beta = -21.58$; $P = 0.969$), in the long-term, the reduction in the daily case is very considerable and significant ($\beta = -317.31$; $P < 0.01$). Estimates also show that lockdown resulted in a significant decrease in daily death from COVID-19 at short-term and long-term (Table 1). In other words, immediately (1 week) after lockdown, 139 ($P < 0.01$) and continuing 12 ($P < 0.01$) deaths per day has been decreased.

It should be asserted that, in our research, short-term means 1 week after lockdown and long-term means from after 1 week until January 14, 2021 (approximately 50 day).

Results also can be found in the Figure 2. Dots show actual values of daily incidence and death from COVID-19. Red and green lines indicate the fitted regression lines before and after of lockdown, respectively.

Discussion

This study found that the lockdown could be an effective intervention for decreasing the incidence and death numbers in the COVID-19 outbreak. This finding is in line with other reports in different countries. As Alfano and Ercolano showed in a cross-country panel analysis, lockdown is an effective strategy, especially around 10 day after implementation.[9] Lockdown also could significantly decrease the spread of COVID-19 in Greece,[10] Portugal,[11] and Italy.[5] Studies showed that lockdown

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interventions could be more effective if they accompanied other strategies, such as wearing masks.[4]

In Iran, as in many other countries, lockdown intervention is accompanied by other interventions, such as increasing the number of tests, patient follow-up, financial support of vulnerable households, restrictions on population movement and mass-gatherings, and school and university closures from the beginning of the outbreak. Therefore, maybe other interventions played a role in this decrease, but the lockdown played the main role according to analysis and literature, especially when it is more than 10 day long.[9]

It should be considered that the effect of a lockdown intervention could be seen in the short-term.[9,10] Usually, after the lockdown, the trend in infections could again increase. Therefore, policy-makers should be alert and apply other effective interventions to preserve lockdown success.

As an effective intervention in controlling the COVID-19 outbreak, lockdown could have a negative impact economically on households and businesses,[1] and especially on people's mental health.[12–14] Therefore, health systems could not rely on it as a long-term and repetitive intervention.[2] The cost-effectiveness of the lockdown and other interventions should be analyzed and considered by the researchers and policy-makers.

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