Minimizing the Effects of COVID-19 Using Optimal Control Strategies

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Abstract

Over the past few decades, researchers have paid more focus to finding the optimal method for controlling infectious diseases. Recently, the idea of optimal control has widely been used to discuss the spread of COVD-19 pandemic. In this article, we consider a mathematical model to show the transmission of this virus with constant rates. Then, the optimal control technique is applied on the model with two different scenarios. The first scenario contains two different controls such as treatment and vaccination rate. However, the second scenario is dealing with treatment and vaccination effect. Accordingly, this study identifies the impact of these control mechanisms as time-dependent interventions using mathematical modeling and an optimal control method with Hamilton technique and Pontryagin's maximum principle. Computational results show that the use of treatment in the high level has the biggest impact in the minimizing the total infected people. Furthermore, the suggested mathematical model with and without control variables are accurately analyzed using the forward-backward Runge Kutta method in MATLAB for initial states and parameters. The findings of optimal control here indicate that the suggested scenarios may effective use for reducing the number of infected individuals and improving public health strategies more widely.

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