Review of: "Qualitative Analysis of a Time-Delay Transmission Model for COVID-19 Based on Susceptible Populations With Basic Medical History"

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Potential competing interests: No potential competing interests to declare.

I have read this paper entitled ‘Qualitative Analysis of a Time-Delay Transmission Model for COVID-19 Based on Susceptible Populations with Basic Medical History’ in details. It contains some interesting and important results. Nevertheless, the paper needs some improvement in order to publish in a reputed journal. Therefore I would like to recommend the article to be re-considered for publication after some minor modifications as follows:

- Clarify and discuss the motivation of this study, and the novelty and the significance of the results obtained.
- I strongly recommend expanding: Introduction, Results, Conclusions, and Discussion sections. Please write clearly the gap you are bridging in the paper. Write your result in the abstract as well just to extend the abstract section. Also, expand the discussion section to highlight the relevance and interest of this work for its aimed scientific community.
- The authors should mention key features of the method used to compute the threshold number. Do you know about any other method for the computation of threshold parameter?
- You have worked only to analyze the dynamical behavior of the Corona disease through S1S2EIR model. Nothing new in the analysis part. For example, it is more convenient to introduce delayed terms at early stage for the transmission between susceptible and exposed people. Justify your modeling purposes.
- The sensitivity analysis of the embedded parameters in the basic reproduction number R0 must be determined and Table/Figure showing the sensitivity indices of the embedded parameters are incorporated and discussed.
- Include the bifurcation analysis of the model problem with respect to the obtained basic threshold number and determine whether the model exhibit forward or backward bifurcation. Appropriate bifurcation diagram must be incorporated and discussed.
- I am very much disappointed on the analysis part of the model specially the numerical simulation. Do mention the source of the numerical data used for the analysis of developed model.
- To strengthen the numerical analysis, I recommend analyzing numerically the pandemic model by implementing constant control strategies like vaccination, quarantine, or treatment supported by mixed strategy approach. The aim should to reduce the incurred expenses and the rate of infectivity.
- Why you have not described the optimal control strategy for the execution of preventive programs? In this scenario, the objective would still revolve around diminishing costs and the number of infected cases. What you say?
- Conclusion should be enhanced by including the future work and direction The authors have mentioned that their

future study could extend this research. I suggest writing two to three lines more about your task. For example, authors can give an idea of their future plan regarding the optimal control analysis of the current general model utilizing a mixed-Strategy approach introduced in this work (as mentioned before). How you proceed and what will be the final outcomes? Please mention.

- Increase the number of references by including these recent and relevant research articles to solve a variety of epidemic models in the existing literature:

1. Computationally efficient optimal control analysis for the mathematical model of Coronavirus pandemic, Expert Systems With Applications 234 (2023) 121094.
2. Implementation of computationally efficient numerical approach to analyze a Covid-19 pandemic model,Alexandria Engineering Journal (2023) 69, 341-362.
3. Numerical approach to solve Caputo-Fabrizio-fractional model of corona pandemic with optimal control design and analysis, Mathematical Methods in Applied Sciences, 1–32, 2023.
4. Numerical analysis of Atangana-Baleanu fractional model to understand the propagation of a novel corona virus pandemic, Alexandria Engineering Journal (2022) 61, 7007–7027.
5. Mathematical analysis for the effect of voluntary vaccination on the propagation of Corona virus pandemic, Results in Physics 31 (2021) 104917.
6. Effect of quarantine on transmission dynamics of Ebola virus epidemic: a mathematical analysis, European Physical Journal Plus, Vol. 136, Issue 4, Article no. 355, pp: 1-33, 2021.
7. Mathematical analysis to control the spread of Ebola virus epidemic through voluntary vaccination, European Physical Journal Plus, Vol. 135, Issue 10, Article no. 775, pp: 1-34, 2020.
8. A reliable and competitive mathematical analysis of Ebola epidemic model, Advances in Difference Equations, Vol. 2020, Issue 1, Article no. 540, pp: 1-24.