Review of: "Analysis of the Spread of Covid-19 via Atangana-Baleanu Fractional Derivatives"

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Potential competing interests: No potential competing interests to declare.

Review Report

Manuscript title: Analysis of the Spread of Covid-19 via Atangana-Baleanu Fractional Derivatives.

Journal Name: Qeios

Comments to the Author

The authors study the spread of the epidemic via Atangana-Baleanu Fractional Derivatives. The authors present the mathematical analysis and formulation of a fractional model for the epidemic, and they proved the existence and uniqueness of the solution for the proposed model. Additionally, they studied the existence of a disease-free equilibrium and analyzed its stability properties. Also, they validated the theoretical results, provided a numerical scheme for the fractional model, and presented various simulation results.

The manuscript is very interesting but needs some improvement:

1. Authors need to improve the Abstract so that it briefly describes the complete work of the paper.
2. The authors should mention the novelty of the paper in a precise way.
3. The authors are advised to add more recent work in the introduction section such as:

A. Shiferaw Geremew Kebede & Assia Guezane Lakoud (2024) Existence and stability of solutions for time-delayed nonlinear fractional differential equations, Applied Mathematics in Science and Engineering, 32:1, 2314649, DOI: 10.1080/27690911.2024.2314649

B. Kebede SG, Lakoud AG. Analysis of mathematical models involving nonlinear systems of Caputo–Fabrizio fractional differential equations. Boundary Value Probl. 2023;2023(1):44. doi: 10.1186/s13661-023-01730-5

1. In the preliminaries, Remark 1, in mathematical expression number 2, the authors used “d,” and in definition 4, page 7, $X(t) = x1(t)\ x2(t)\ x3(t)\ x4(t)\ x5(t)\ x6(t)\ x7(t)\ T$, before defining it.
2. Which theorem have the authors used for the stability of the solution?
3. The authors haven’t mentioned some known fixed point theorems (theorems) to investigate the existence and uniqueness, as well as for stability. The authors simply used only boundedness and continuity to show the existence and uniqueness. Hence, the presentation of the paper should be improved.
4. Check throughout the paper for typos and misspellings.

Remark 2. Let $f(t) \in C[a, b]$ and $ABDD\gamma f \in C[a, b]$ for $0 < \gamma \leq$**?** etc. (Please check all the paper)

1. Theorem 1, **Step 3** the authors defined the matrix norm as $|||.|||$, where $|||M||| = \rho(M)$ and $\rho(M)$ represents the largest eigenvalue of the matrix M on page 7. Is this definition correct? Authors must redefine and cite the definition.
2. The authors must revise the conclusion of the paper and also mention the future direction.

Comment:

Revising this paper by addressing all the above-suggested corrections will improve the quality of this paper, and hence, it will be recommended for possible publication in this journal.