Fractional analysis of an SIS epidemic model with age structure

by:

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We would like to thank all referees for their useful comments which improved the work.

Reviewer reports:

The authors investigate a fractional order SIS-like model of an epidemic spreading in an age structured population. The model is formulated as an abstract fractional Cauchy problem in a Banach space. The authors show the existence and uniqueness of the mild solutions to this problem. I think that it is an interesting and important work.

Response: First of all, we would like to thank you so much for your valuable time in reviewing our paper. We have revised our paper again according to your valuable comments. We hope that it is suitable now. We are looking forward to receiving your positive response dear Professor.

* It is not clear what is $T(t)$ in the definition of M on page 2.

  Response: $T(t)$ is a C_0 semigroupe that is defined in section "The basic model" page 5.

* The main result of the paper consists in (5.18) – basic reproduction number for your model. Do you compare your results with well-known $\mathcal{R}_0$ by SIS system and other systems based on the same scheme as yours? What does $\mathcal{R}_0$ (5.18) describe? Is it physical?

  Response: Thank you for this comments. For $\mathcal{R}_0$ (5.18) we have added some references for more details see version pdf. $\mathcal{R}_0$ (5.18), it describe the potential for disease transmission within specific subgroups or compartments of a population. Each subgroup represents individuals who have similar contact patterns with each other. $\mathcal{R}_0$ is a mathematical concept used in epidemiology to describe the potential for a contagious disease to spread within a population. It is

not a physical quantity in the sense of something you can touch or measure directly but rather a parameter that characterizes the transmission dynamics of a disease. We hope it is acceptable now.

* What is a role of Caputo derivative? Do you compare the results for $\mathcal{R}_0$ or modeling curves for $\alpha = 1$ and $0 < \alpha < 1$? There exist some papers in epidemic modeling that show very small differences between partial derivative in classical meaning with Caputo ones.

  Response: Fractional-order derivatives play a crucial role in epidemic modelling due to their capacity to incorporate memory and hereditary characteristics. By utilizing these non-integer derivatives, epidemic models become more realistic and reflective of real-world dynamics. The memory effect allows the models to retain and integrate past information, enabling them to make more accurate predictions and interpretations of how epidemics unfold over time. As a result, the use of fractional-order derivatives provides a valuable tool for understanding and effectively responding to infectious disease outbreaks. Furthermore, we have added some works in fractional epidemic models.

* What is the usage of your model in the real life? Is it possible to find close to the reality stable numerical solution of (3.6)?

  Response: We have added a motivation in introduction by giving some examples of diseases

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With kind regards

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