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Global dynamics of a fractional order SIR epidemic model for HIV transmission with memory

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Abstract

In this paper, we investigate and analyze a nonlinear fractional order SIR epidemic model with Crowley-Martin type functional response and Holling type-II treatment rate. The existence and stability of the equilibrium points are investigated. The sufficient conditions for the persistence of the disease are provided. First, we obtained a threshold value $\mathcal{R}_0$, which determines the stability of equilibria, then model equilibria are determined, and their stability analysis are considered by using fractional Routh-Hurwitz stability criterion and fractional La-Salle invariant principle. The fractional derivative is taken in Caputo sense and the numerical solution of the model is obtained by L1 scheme method which involves the memory trace that can capture and integrate all past activity. Meanwhile, by using Lyapunov functional approach, the global dynamics of the endemic equilibrium point is discussed.

Biography:

Parvaiz Ahmad Naik received his M.Sc degree in Mathematics from the University of Kashmir, Kashmir, India in 2008 and Ph.D. degree from Maulana Azad National Institute of Technology, India in 2015 with major mathematical modeling. In 2016, he joined the Islamic University of Science and Technology, Srinagar, Kashmir as Assistant Professor and served there from 2016-2017. From 2018, he is working as postdoctoral research fellow with Prof. Jian Zu at the school of Mathematics and Statistics, Xi'an Jiaotong University, P. R. China. He has published more than 15 research papers in the journals of international repute like World Scientific, Elsevier, Springer, American Scientific, Taylor & Francis etc. He has received two young scientist awards (gold medals) for his outstanding research work in the field of mathematical biology. His area of interest includes differential equations, calcium dynamics, mathematical biology and disease dynamics.

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Speaker Publications:

1. "Modeling the mechanics of calcium regulation in T lymphocyte: A finite element method approach"; International Journal of Biomathematics/ Vol 13, 2020.

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