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Analysis of malaria dynamics using its fractional order mathematical model. (English)

Zbl 07452316
J. Appl. Math. Inform. 39, No. 1-2, 197-214 (2021)

Summary: In this paper, we have studied dynamics of fractional order mathematical model of malaria transmission for two groups of human population say semi-immune and non-immune along with growing stages of mosquito vector. The present fractional order mathematical model is the extension of integer order mathematical model proposed by Ousmane Koutou et al. For this study, Atangana-Baleanu fractional order derivative in Caputo sense has been implemented. In the view of memory effect of fractional derivative, this model has been found more realistic than integer order model of malaria and helps to understand dynamical behaviour of malaria epidemic in depth. We have analysed the proposed model for two precisely defined set of parameters and initial value conditions. The uniqueness and existence of present model has been proved by Lipschitz conditions and fixed point theorem. Generalised Euler method is used to analyse numerical results. It is observed that this model is more dynamic as we have considered all classes of human population and mosquito vector to analyse the dynamics of malaria.

MSC:

34A34 Nonlinear ordinary differential equations and systems
34B60 Applications of boundary value problems involving ordinary differential equations
65L05 Numerical methods for initial value problems involving ordinary differential equations
92B05 General biology and biomathematics

Keywords:

Atangana-Baleanu fractional order derivative in Caputo sense; Atangana-Baleanu fractional order integral in Caputo sense; fractional order mathematical model of malaria; generalised Euler method

Full Text: DOI

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