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## MODELING THE IMPACT OF EARLY CASE DETECTION ON DENGUE TRANSMISSION: DETERMINISTIC VS STOCHASTIC

Akhil Kumar Srivastav\* and Mini Ghosh

Division of Mathematics, School of Advanced Sciences, Vellore Institute of Technology, Chennai, India

akhilkumar.srivastav@vit.ac.in (\*corresponding author), minighosh@vit.ac.in

Dengue fever is a mosquito-borne tropical disease caused by the dengue virus. It is spread by several species of female mosquitoes of the Aedes type. There are rapid dengue diagnostic kits commercially available in the market. Early detection of dengue is possible using this kit and one can get cured from dengue disease without much complications [1]. Keeping in view the fact that early detection can influence the transmission dynamics of dengue disease, a nonlinear mathematical model is formulated and analyzed to study the dynamics of dengue. The basic reproduction number  $R_0$  of the proposed model is computed and all possible equilibria of the model are obtained. Stability analysis for different equilibria of the proposed model is discussed in detail. The nontrivial equilibrium exists only when the basic reproduction number  $R_0 > 1$  and it is locally asymptotically stable under some restriction on parameters. The sensitive analysis is performed to identify the key parameters associated with the basic reproduction number  $R_0$ . Further the ODE model is converted to stochastic model and results of stochastic and deterministic models are compared using numerical simulation[2, 3].

## References

- S. M. Wang, S. D. Sekaran. (2010). Early Diagnosis of Dengue Infection Using a Commercial Dengue Duo Rapid Test Kit for the Detection of NS1, IGM, and IGG. Am. J. Trop. Med. Hyg., 83(3): 690-695. doi:10.4269/ajtmh.2010.10-0117
- [2] Y. Yuan, Linda J. S. Allen. (2011). *Stochastic models for virus and immune system dynamics*. Math. Biosci. 234:8494.
- [3] Linda J. S. Allen. (2010). An Introduction to Stochastic Processes with Applications to Biology. CRC press, Boca Raton, Florida, USA.