Assessing the Impact of Treatment in the Dynamics on Dengue Fever: A Case Study of India

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Dengue is one of the most widely spread mosquito-borne viral diseases which is transmitted by mosquitoes of Aedes species. It is endemic in all states and union territories (UTs) of India. Dengue virus is one of the major cause of illness and death in the tropical and subtropical regions. There is no vaccine available which can prevent infection with dengue virus. The best way to reduce the transmission of this disease is to avoid mosquito bites. Treatment of dengue infected individuals is an important factor which contributes significantly in the reduction of transmission of this disease. But sometimes in the developing countries it is not always possible to give treatment to each infected individuals. That is why we include treatment function in our model. In the present paper, a mathematical model for dengue virus transmission with treatment by considering logistic growth of mosquito is formulated and analyzed. It is assumed that the treatment rate is proportional to the number of infectives below the capacity and is constant when the number of infectives is greater than the capacity. We find that the system exhibits backward bifurcation if the capacity is small. When the basic reproduction number (R_0) is greater than one, the endemic equilibrium point exists and is locally asymptotically stable under some restriction on parameters. We estimate the parameter corresponding to transmission of dengue using real data from different states of India by least square method. We also perform sensitivity analysis to identify the key parameters which influence the basic reproduction number and hence regulate the transmission dynamics of dengue.

REFERENCE

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