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EFFECT OF PARTIAL IMMUNITY, INDEX OF MEMORY AND PULSE VACCINATION ON THE DYNAMICS OF AN EPIDEMIC MODEL

The control of vector-borne infections is of paramount importance due to the significant impact these diseases have on public health, economies, and overall well-being. In this work, we will present an epidemic model for the transmission phenomena of dengue fever with nonlinear forces of infection through fractional derivatives. Several basic results are determined for the recommended fractional model of dengue infection. We established stability results and sensitivity analysis of the basic reproduction number has been shown. In addition, we have shown the impact of memory on the basic reproduction number numerically with a variety of different parameters. We conclude that the biting rate, recruitment rate of mosquitoes, and index of memory are the most sensitive factors, which can effectively lower the level of dengue fever. The dynamical behavior of the proposed fractional system is presented through a numerical scheme to explore the overall transmission process. We predict that the fractional-order model can explore more accurately and preciously the intricate dengue disease transmission model rather than the integer-order derivative. We also introduced a pulse vaccination strategy in the susceptible host population to examine how the frequency and intensity of implementation of this strategy affect the dynamics of dengue infection. We successfully obtained the threshold dynamics by defining the basic reproduction number, which is the spectral radius of the next-generation operator and governs whether the disease dies out or not. The finding indicates that a frequent implementation of the vaccination strategy with great intensity and the use of mosquito nets can essentially lead to a decline in new infections.

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