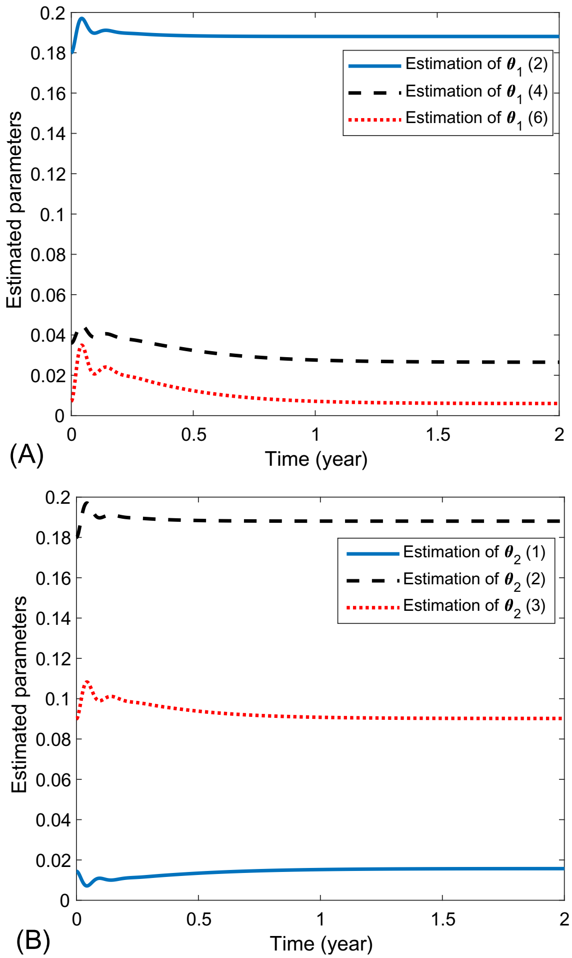

FIG. 9 Estimation of parameters in (A) θ_1 and (B) θ_2 during the treatment period based on the adaptation laws (15) and (16), respectively.

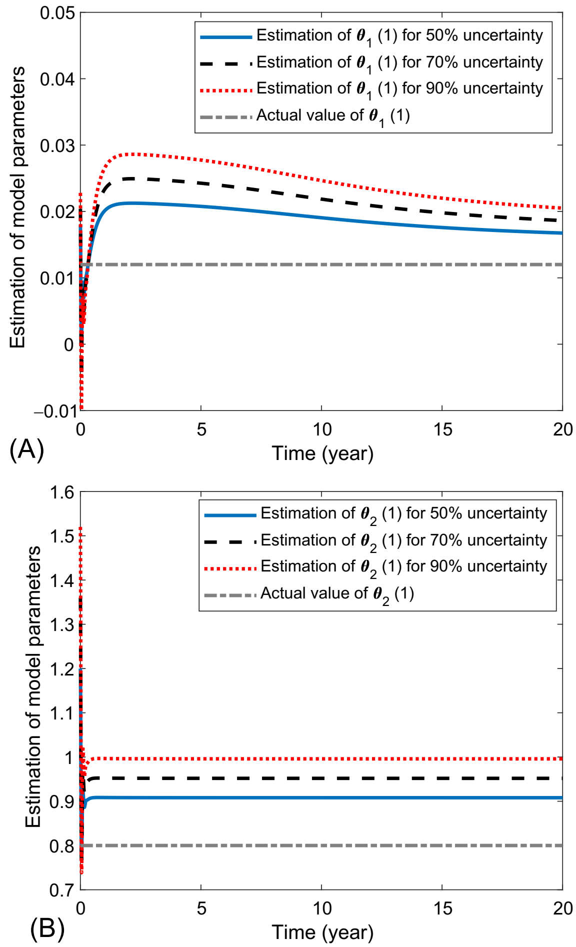

FIG. 10 Adaptation of (A) $\theta_1(1)$ and (B) $\theta_2(1)$ using Eqs. (15) and (16), respectively, for different uncertainty levels.

6. CONCLUSION

In the present study, a new nonlinear adaptive strategy was developed to control the hepatitis C virus epidemic based on a mathematical model having uncertainties. For the first time, an adaptive feedback controller was employed to decrease the populations of unaware susceptible and chronically infected compartments based on the desired scenarios. Two control inputs were employed for this goal. The first one is the effort rate to inform the susceptible individuals from the HCV and the second one is the rate of treatment for chronically infected people. The Lyapunov stability theorem and Barbalat's lemma were used to prove the tracking convergence to desired treatment scenarios. The proposed control laws and adaptation laws provided the stability of the closed-loop HCV epidemic system in the presence of parametric uncertainties. Results of numerical simulations showed that by adjusting the control inputs and the estimated parameters based on this strategy, the number of the unaware susceptible and chronically infected individuals are decreased. As a result, the population of the aware susceptible was increased and the population of the acutely infected and treated classes reached out to zero at the end of the process. Moreover, the obtained results implied that the tracking convergence is achieved for a wide range of uncertainties. Designing optimal trajectories and employing unstructured uncertainties can be considered as the next steps of this research in the future.