Abstract

The Covid-19 pandemic has developed as a frightening and prevalent worldwide menace, trigger a conflux of multidimensional challenges that exceed geographic borders and has remarkably effect in many fields of daily life like economies and global health. The main purpose of our work is to study the Covid-19 disease by applying nonstandard finite difference scheme (NSFD) on the Covid-19 model. We developed new nonlinear bi-susceptible Covid-19 model and our mainly purpose to understand and illustrate the transmission and dynamics of Covid-19. To overcome the disease from population we introduce vaccination and hospitalization compartments in this model. Firstly, we are used analytical techniques to build locally and globally asymptotic behaviour of Covid-19 model. By imposing conditions on R_0, two main equilibrium states are obtained. We proved some fundamental properties. Secondly, we studied the numerical stability of this model by implementation of NSFD scheme. For the visualizations of results we can used computational tool MATLAB. Then we applied control strategies by taking vaccination and hospitalization as constant and to observe the effects of parameters of this model on reproduction number, we calculate sensitivity. Numerical results predicts that applying both control strategies with proper vaccination campaign and social distance can be very beneficial in the elimination of disease. The optimal control problems have been solved by Pontryagin Maximum Principle (PMP) to control the disease and to find the most successful time dependent controls. The productiveness and efficiency of optimally designed control strategies are demonstrated through numerical simulations performed before and after optimization process. Our consequences give the confirmation of productive apply of control strategies to achieve favorable outcomes to reduced the financial cost and the elimination of disease.