

Abstract

In this paper, we propose and analyze a mathematical model for Pneumonia–Typhoid co-infection to examine their characteristic relationship due to preventive and treatments strategies. Firstly, we qualitatively analyzed the model, and the basic reproduction number is determined with respect to the existence and stability of equilibria. The possibility of bifurcation is studied and also we investigated the sensitivity index of co-infection model reproduction number together with the local and global stability of the equilibria. Secondly, we extend the co-infection model by incorporating time dependent controls as intervention and we used Pontryagin's maximum principle for derivation of necessary conditions for the optimal control and optimality system. Finally, the optimality system is numerically simulated by considering four strategies and also their cost effectiveness is analysed. We found that Pneumonia treatment with Typhoid fever prevention costs least. Therefore, for optimal cost effective control of both diseases, the policy makers must focus more on prevention strategy while treating the infected individual is not neglected.