Abstract

Meningitis ia a serious bacterial disease that can cause inflammation of the meninges, the protective layer covering the brain and the spinal cord. In the research, we use mathematical modeling to understand the transmission and dynamics of Meningitis disease. We include Quarantine and Hospitalization compartment to reduce the disease from the community. We prove many analytical properties of the Meningitis disease model i.e., uniqueness, boundedness, existence and positivity of the model. We determine disease free equilibrium points (DFE) and endemic equilibrium points (EE) as well as local and global stability at their equilibrium points to perceive the transmission of Meningitis disease model. Using Next Generation method to determine the Reproduction Number $\mathcal{R}_0$. We apply Non-Standard Finite Difference (NSFD) method to understand the Numerical stability. Sensitivity Analysis of Meningitis disease model is also discussed to understand the effect of each parameter of the model on $\mathcal{R}_0$. To control and cease the Meningitis disease from the comunity, we solved optimal control problem by Pontryagin Maximum Principle (PMP).