

# Abstract

The central focus of this research work is an extended form of an SEIR model, to which we are adding compartments of Exposed but known, Exposed but unknown, and post-exposure-prophylaxis to better understand the dynamics and spread of HIV/AIDS transmission in different compartments. The disease free equilibrium as well as the endemic equilibrium points can be used to understand disease dynamics. We also computed the local and global stabilities. The reproduction number  $R_0$  on disease free equilibrium, is calculated which use Next-generation matrix method for given model being investigated. Furthermore, a sensitivity analysis is provided to examine how model parameters affect the reproduction number  $R_0$ . In order to minimise the disease's impact on objective functioning, we applied the Pontryagin maximal principle for control strategies. Finally, numerical simulations are provided, which are supported by graphical representations of the results.