Mathematical Models of Infectious Diseases and Social Issues

When deadly illness spreads through a population at a rapid pace, time may be of the essence in order to save lives. Using mathematics as a language to interpret assumptions concerning the biological and population mechanics, one can make predictions by analyzing actual epidemiological data using mathematical tests and results. Mathematical models can help us understand the right disease status and predict the effects of the disease on populations, which can help limit the spread and devastation of the illness.

Mathematical Models of Infectious Diseases and Social Issues is a collection of innovative research that examines the dynamics of diseases and their effect on populations. Featuring coverage of a broad range of topics including deterministic models, environmental pollution, and social issues, this book is ideally designed for diagnosticians, clinicians, healthcare providers, pharmacists, government health officials, policymakers, academicians, researchers, and students.

Topics Covered

- Air Pollution
- Co-Infections
- Deterministic Models
- Disease Dynamics
- Disease Prediction
- Environmental Pollution
- HIV-HCV-HBV
- Population Mechanics
- Social Issues
- Vector-Borne Diseases
- Water-Borne Diseases

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Chapter 7
Stability Analysis of Co-Infection of Malaria-Dengue

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ABSTRACT

Dengue and malaria most commonly occur in tropical and sub-tropical areas. Dengue is a viral infection in a human being caused by a bite of a female aedes mosquito whereas malaria is caused by plasmodium parasite transmitted by a bite of infected mosquito. In this chapter, a mathematical model of co-infection of malaria and dengue is described by deterministic system of non-linear ordinary differential equations. This system considers the force of infection which is applied to dengue susceptible individuals. Moreover, two sub-models, namely malaria-only and dengue-only, are also constructed to study the transmission dynamics. Basic reproduction number is calculated for these models to investigate the existence of the models. The system is proved to be locally and globally stable at its equilibrium points. Stability of these models is also shown through numerical simulation.

INTRODUCTION

Now-a-days, due to environmental conditions and human behavior, population is prone to many viral infectious diseases. Most commonly occurring diseases in tropical and sub-tropical areas are due to mosquito bites. Some of the vector borne diseases are malaria, dengue, chikungunya, zika fever, filariasis etc. Among them malaria and

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