EFFECTS OF CONTACT TRACING AND QUARANTINE STRATEGIES IN REDUCTION OF SPREAD OF AN EPIDEMIC

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Abstract: In this paper, a compartmental model is proposed to study the effects of contact tracing and quarantine strategies to reduce the spread of an epidemic. The basic properties of the model are discussed and the equilibrium points are computed. The basic reproduction number is calculated by using the next-generation matrix approach. After calculating the basic reproduction number R_0, the stability analysis of the model is carried out. Sensitivity and bifurcation analyses are also performed. Numerical simulations are performed to observe the effects of contact tracing and quarantine strategies in reducing the spread of the epidemic. The results are displayed graphically to justify the analytical findings. The disease-free equilibrium point is shown to be locally asymptotically stable when $R_0 < 1$ and unstable when $R_0 > 1$ and the endemic equilibrium point is shown to be locally asymptotically stable.

Keywords and Phrases: High and low infection risks, equilibrium points, stability analysis, bifurcation analysis and numerical simulations.

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1. Introduction

Mathematical modelling has become very important tool in epidemiology to understand the dynamics of infectious diseases and predict the consequences of introducing public health interventions to control the spread of diseases. Among all