AN SVIQR EPIDEMIC MODEL FOR COVID-19

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Abstract: We have proposed an SVIQR epidemic model for COVID-19 with vaccination in this research. Some fundamental characteristics such as positivity of the solution, boundedness and invariance of the model are analyzed. Expressions for disease-free equilibrium (DFE) and endemic equilibrium (EE) points with certain criteria for existence are derived. Rigorous analysis of the model reveals that associated DFE is locally asymptotically stable whenever the effective reproduction number is less than one. Also, the EE point is stable whenever certain restrictions are satisfied. Sensitivity analysis is performed to identify key parameters that significantly affect the effective reproduction number. Analytical results are illustrated using parameter values and the results are analyzed using numerical simulation which suggests that the disease will eventually die out, particularly if the control measures are implemented above a specified level for a sustained period of time.

Keywords and Phrases: Covid-19, equilibrium points, stability, effective reproduction number, sensitivity index, numerical simulation.

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1. Introduction

Mathematical modelling plays a vital role for understanding disease dynamics and predicting the future scenario of the disease transmission so government may establish policies to control rapid spread of the disease in absence of an effective